



Investigating Tule Elk

at Point Reyes National Seashore



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Publishing Information

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The listing of a resource in this curriculum does not presume its endorsement by the National Park Service.

This guide may be obtained by participating in a teacher workshop at Point Reyes National Seashore or through a teacher in-service training at your school.

Teachers are encouraged to offer their feedback by filling out the enclosed evaluation form or contacting Point Reyes National Seashore directly.



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Preface

The intent of these guides is to provide middle school students with the opportunity to observe natural processes at Point Reyes National Seashore so they might take a greater interest in environmental stewardship and science. Teachers from fifteen area schools developed and field-tested seven “Creating Coastal Stewardship through Science” guides for classroom and field trip use. Each guide is carefully designed to facilitate a hands-on learning experience using science and the environment. Natural resources such as Pacific gray whales, northern elephant seals, tule elk, California quail, Douglas iris, and the San Andreas Fault are highlighted because they are easy to identify and to observe. All activities are linked to the California State Science Standards (2000) and the National Science Standards.

You may use this guide alone or in conjunction with other guides. We highly recommend that whenever you use a guide, you use the pre-visit activities to fully prepare the students for the field trip. These activities address student safety, wildlife observation techniques, equipment use, field journal development, and concepts that need to be taught prior to the Park visit. The post-visit activities are also critical to the learning process because they guide the students in making scientific deductions and in developing environmental stewardship ethics.

Following this preface, you will find background information on the National Park Service and an overview of Point Reyes National Seashore. To provide your students with a better understanding of the place they will be visiting, we recommend you share this information with them. For an in-depth overview of the National Park Service, visit our website at **www.nps.gov**.

Point Reyes National Seashore provides outstanding opportunities for learning about natural and cultural resources. There are also exceptional educational opportunities provided by Park partners such as the Point Reyes Bird Observatory, Audubon Canyon Ranch, and Point Reyes National Seashore Association. To learn more about the Park and our partners, visit our website at **www.nps.gov/pore**.



THE NATIONAL PARK SERVICE

The National Park Service cares for special places saved by the American people so that all may experience our heritage.

Experience Your America

On August 25, 1916, President Woodrow Wilson signed the act creating the National Park Service, a new federal bureau in the Department of the Interior responsible for protecting the 40 national parks and monuments then in existence and those yet to be established.

This “Organic Act” of 1916 states that “the Service thus established shall promote and regulate the use of Federal areas known as national parks, monuments and reservations . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”



Olympic National Park



Golden Gate National Recreation Area

The National Park Service still strives to meet these original goals, while filling many other roles as well: guardian of our diverse cultural and recreational resources; environmental advocate; world leader in the parks and preservation community; and pioneer in the drive to protect America’s open space.

The National Park System of the United States comprises over 379 areas covering more than 83 million acres in 49 states, the District of Columbia, American

Samoa, Guam, Puerto Rico, Saipan, and the Virgin Islands. Although not all parks are as well known as the Grand Canyon and Yellowstone, all are areas of such national significance that they have been included in the National Park Service — ancient ruins, battlefields, birthplaces, memorials, recreation areas, and countless other wonders. Point Reyes National Seashore is one of ten national seashores.



Mesa Verde National Park



Grand Canyon National Park

The future of the National Park System lies in understanding and protecting its meanings, values, and resources. Each part of the system represents the United States and a part of our heritage. Preservation of individual sites and the entire system will ensure the essence of quality remains in our lives and the lives of all future generations.



POINT REYES NATIONAL SEASHORE

Point Reyes National Seashore was established to preserve and protect the natural and cultural features and natural ecosystems along the diminishing undeveloped coastline of the western United States. Located just an hour's drive from a densely populated metropolitan area, the Seashore is a sanctuary for countless plant and animal species. With half of Point Reyes National Seashore designated as wilderness, it provides a sanctuary for the human spirit — for discovery, inspiration, solitude, and recreation — and a reminder of the human connection to the land.



Bruce Farnsworth

Point Reyes National Seashore comprises over 71,000 acres, including 32,000 acres of wilderness. Estuaries, windswept beaches, coastal scrub, coastal grasslands, salt marshes, and coniferous forests create a haven of 80 miles of unspoiled and undeveloped coastline located just an hour's drive from an urban area populated by seven million people. Abundant recreational opportunities include 140 miles of hiking trails, backcountry campgrounds, and numerous beaches.



Sue Van Der Wahl

The San Andreas Fault separates the Point Reyes Peninsula from the rest of the North American continent. Granite bedrock found here and not found again until the Sierra Nevada range suggests the Peninsula is geologically dynamic. According to geologists, the land that is now called Point Reyes has moved some 300 miles northwest over a period of 100 million years and is still moving.



Rich Salkin

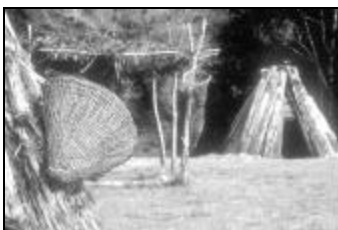
As wildland habitat is developed elsewhere in California, the relevance of Point Reyes as a protected area with a notably rich biological diversity increases. Over 45% of North American avian species and nearly 18% of California's plant species are found here. Point Reyes also contains some examples of the

world's major ecosystem types. For this reason, and because Point Reyes is dedicated to the conservation of nature and scientific research, it was recognized in 1988 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere program and named as part of the Central California Coast Biosphere Reserve.



Bruce Farnsworth

The cultural history of Point Reyes spans many lives and ways of living with the land. The Coast Miwok people are the first known residents of this peninsula. Archeologists have identified over 100 village sites in the Seashore and cultural traditions are still celebrated in the Park annually. Overlapping the Coast Miwok were Mexican land grantees, lighthouse keepers, and lifesaving station crews. To this day, agricultural operations that were built near the turn of the twentieth century continue within the Seashore's pastoral zone.



NPS Collection



Educational Opportunities at POINT REYES NATIONAL SEASHORE

Point Reyes National Seashore provides an outdoor classroom and learning laboratory for the study of geological and ecological processes and changing land-use values in which a greater understanding of and caring for public lands can be fostered.

Ranger-led Curriculum-based Education Programs

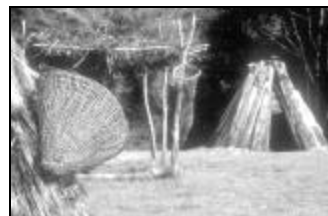
Reservations for Ranger-led programs are requested in writing and assigned on a first-come, first-served basis. Visit **nps.gov/pore** for the reservation form and calendar.

K-2 Students explore the natural resources of the Seashore with Park Rangers in the Bear Valley area or in their classroom.



NPS Collection

3-4 Students immerse themselves in the Coast Miwok culture by completing a comprehensive curriculum and visiting the Coast Miwok cultural exhibit, Kule Loklo.



NPS Collection

4 Students revisit the days of early lighthouse keepers while operating the original Point Reyes Lighthouse clockwork with Park Rangers.



NPS Collection

5 Students study the oceanic influences on the Point Reyes Peninsula by completing a classroom curriculum and viewing gray whales and elephant seals with Park Rangers.



Sue Van Der Wouh

6-8 Students participate in Ranger-led stewardship activities such as habitat restoration, water quality monitoring, and beach cleanups.

Ranger-led Training Programs

9-12 Students become DOCENTS to assist middle school teachers with classroom teaching and use of scientific research tools on Seashore field trips (service learning credits earned).



NPS Collection

Students become RESEARCH ASSISTANTS at the Pacific Coast Learning Center by participating in the inventorying and monitoring of Seashore resources.

Teachers Teacher workshops are offered throughout the year for existing Park curricula and for field trip planning. Visit the Seashore's website at **www.nps.gov/pore** for a calendar of workshops.



NPS Collection

Classroom and Field Trip Curriculum

Based on the National and State Science and Social Science Standards

3-4



Teacher packets are available for field trips to the recreated Coast Miwok village, Kule Loklo, located near the Bear Valley Visitor Center.

The “Creating Coastal Stewardship through Science” middle school curricula are available to teachers who attend a one-day workshop at Point Reyes or a teacher in-service training.

6-8



Completion of the **Identifying Resident Birds Curriculum**, as a companion to a birdwatching field trip, will enable students to observe and identify different bird species, their habitats, and their behaviors. A visit to Point Reyes Bird Observatory will also enable students to observe bird banding and netting and to understand the most common threats to bird survival.



Completion of the **Monitoring Creek Health Curriculum**, as a companion to a Ranger-led creek program, will enable students to observe and understand the complexity and sensitivity of creek habitats and their role in protecting them.



Completion of the **Discovering Northern Elephant Seals Curriculum**, as a companion to an elephant seal viewing field trip, will enable students to observe and understand the amazing adaptations and behaviors of northern elephant seals.



Completion of the **Defining Habitats Curriculum**, as a companion to a Park field trip, will enable students to observe and understand the complex land and ocean habitats of the Point Reyes Peninsula and their roles in habitat protection.



Completion of the **Uncovering the San Andreas Fault Curriculum**, as a companion to a geology field trip, will enable students to observe and understand the existence of the San Andreas Fault and the implications it has for area residents.



Completion of the **Investigating Tule Elk Curriculum**, as a companion to an elk viewing field trip, will enable students to observe and understand elk behaviors and issues that surround their management.



Completion of the **Observing Pacific Gray Whales Curriculum**, as a companion to a whale watching field trip, will enable students to observe and understand gray whale adaptations and behaviors, and the factors that influence their survival.

Educational Facilities



The **Historic Lifeboat Station** is available to educational groups for overnight use. Nightly fees are charged. Group size must be under 25 (including chaperones). Reservations are made on a first-come, first-served basis by completing the boathouse form on our website at www.nps.gov/pore.



The **Clem Miller Environmental Education Center** is an overnight facility available by lottery to school groups visiting for multiple-night stays September through May. The facility is used for summer camps during the summer months. Fees are charged. For information, contact Point Reyes National Seashore Association at (415) 663-1200, website www.ptreyes.org.



The **Pacific Coast Learning Center** is a day-use facility located on Highway 1. This facility is used by researchers and students to study the natural and cultural resources of the Seashore.



The **Bear Valley Visitor Center** is a day-use facility open to school groups Monday through Friday from 9 A.M. to 5 P.M. Exhibits on natural and cultural resources are found here. Books, brochures, and other educational materials are available.



The **Ken Patrick Visitor Center** is located on Drakes Beach, approximately 30 minutes from the Bear Valley Visitor Center. This facility is open year-round on weekends and holidays from 10 A.M. until 5 P.M. Ranger-led elephant seal programs meet at this Visitor Center. Exhibits and a 150-gallon saltwater tank are located here. Books, brochures, and other educational materials are available.



The **Lighthouse Visitor Center** is located on the outermost tip of the Peninsula, approximately 45 minutes from the Bear Valley Visitor Center. This facility is open Thursday through Monday from 10 A.M. until 4:30 P.M. (closed Tuesdays and Wednesdays). Ranger-led whale programs and lighthouse tours meet at this Visitor Center. Exhibits on maritime history and whale biology are located here. Books, brochures, and other educational materials are available.



The **Lighthouse** is located below the Lighthouse Visitor Center at the bottom of a 308-step staircase. The lens room is usually open from 2:30 P.M. until 4 P.M., Thursday through Monday or as weather and staffing permit. High winds always close the lens room. Space in the lens room is limited so reservations are required for groups. Call (415) 464-5100 to confirm existing weather conditions.

Group Camping/Overnight Opportunities

* This listing is provided for your convenience and does not constitute a recommendation or endorsement of any of these facilities.



All overnight camping in **Point Reyes National Seashore** requires a permit and advance reservations. Group sites are very limited and in high demand. Sky, Coast, and Wildcat Camps are all backcountry campgrounds that require hiking to access them. A fee is charged. For more information, visit the Seashore's website at **www.nps.gov/pore**.

The **Point Reyes Hostel** offers a dormitory-style group cabin with a fully equipped kitchen and showers. For additional information and reservations, call (415) 663-8811 during office hours, 7:30 to 9:30 A.M. and 4:30 to 9:30 P.M.

Samuel P. Taylor State Park, located 6 miles east of the Seashore on Sir Francis Drake Boulevard, offers campsites for groups. A fee is charged. Reservations are highly recommended. For more information, visit the reservations website at **www.reserveamerica.com**.

Olema Ranch Campground is located half a mile from Seashore headquarters on Highway 1. It is privately owned. Several large group sites are available. Fees are charged. For more information, call (415) 663-8001.

The **Marconi Center** is located 8 miles north of Seashore headquarters on Highway 1. This facility is operated by California State Parks. Lodging, conference rooms, and catered meals are provided for a fee. For more information, call 1 (800) 970-6644 or visit the website at **www.marconiconfctr.org**.



Investigating Tule Elk

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Creating
COASTAL
STEWARDSHIP
through Science



Investigating Tule Elk

Teacher Preparation

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Investigating Tule Elk



Teacher Preparation

Point Reyes National Seashore provides an inspirational and nearly lost opportunity to observe tule elk in their natural habitat. In 1978, over 100 years after they were thought to be extinct, the majestic tule elk were reintroduced to the Point Reyes ecosystem. Their initial reintroduction was behind a three-mile, ten-foot-high fence. After careful observation for over 20 years, a management decision was implemented to establish a wild, free-ranging herd of tule elk outside the original fenced boundaries. Both of these resource management decisions have brought Point Reyes one step closer to ecological restoration.

Completion of this unit will enable your students to view tule elk in their native landscape and understand the significance of their return to the Point Reyes Peninsula.

Considerations

When: Year around, although July through mid-October is best for observing tule elk in the mating season.

Where: Tomales Point, the northernmost section of Point Reyes National Seashore. It is approximately a 40-minute drive from the Bear Valley Visitor Center to Tomales Point. In addition, there is a 20-minute hike to a suggested location for viewing elk and using field journals (White Gulch).

How: This unit may be used independently of all other units. If you want to use an additional unit during your visit, we suggest "Defining Habitats" to give students a more complete understanding of other resources at Tomales Point and their relationship to tule elk ecology.





Weather: The chart below lists average climate expectations based on previous years' data. The weather is subject to change quickly and can vary dramatically from different locations within the Seashore on the same day.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Temperature												
Normal Daily Maximum	53	55	55	57	60	62	64	64	65	62	58	64
Normal Daily Minimum	41	42	42	43	47	50	51	52	51	48	45	42
Extreme High	78	85	80	92	94	99	96	96	103	96	81	79
Extreme Low	21	26	29	32	32	39	39	42	39	32	29	18
Precipitation												
Normal	12.0	9.0	8.0	4.0	3.0	1.0	0.3	0.8	2.0	4.0	9.0	12.0
Maximum	20.0	16.0	15.0	11.5	8.0	4.0	2.5	6.0	7.0	13.0	18.0	19.0

Seasonal Events: Consult the chart below to assess which months may be best for a class visit to Point Reyes National Seashore.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Gray Whale Migration	✓		✓	✓								
Elephant Seal Breeding	✓	✓	✓									
Bird Migration									✓	✓	✓	✓
Coho Spawning	✓											✓
Steelhead Trout Spawning		✓										✓
Tule Elk Rut Season							✓	✓	✓			
Peak Flower Blooms				✓	✓							
Tidepooling	✓	✓	✓									
Geology	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ocean and Land Habitats	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Resident Birds	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Chaperone Preparedness and Assistance

The success of your field trip will depend on your ability to actively prepare and involve your parent chaperones in the field trip activities. Without adult guidance, many of the students will not complete their field journals. It is essential that your field trip have as much structure as your classroom lessons. To accomplish this, we recommend that you assign each of your parents to a small group of students with the field observations and with the journal questions. Provide chaperones with their own copies of the student journals and encourage them to complete them with the students.

Suggested Lesson Plan



Teacher Preparation

PRE-VISIT		Time Needed: 8 hours
Activity #1	How Can I Learn About the Return of Tule Elk? <i>Students use a newspaper and vocabulary list to complete questions and activities about tule elk natural history and population dynamics.</i>	2 hours
Activity #2	What is a Tule Elk? <i>Students' research and present information about adaptations, behaviors, and life cycles.</i>	2 hours
Activity #3	How is Tule Elk Research Done? <i>Students explore research techniques for tule elk management.</i>	1 hour
Activity #4	What Can We Expect on Our Field Trip to the Tule Elk Reserve? <i>Students prepare for field trip by reviewing expectations and creating field journals.</i>	1 hour
Activity #5	Safety and Stewardship Challenge <i>Proper behaviors around National Park resources are examined in a game format.</i>	1 hour
Activity #6	How Do I Use Binoculars? <i>A successful field trip starts by ensuring all students know how to use binoculars.</i>	1 hour
ON-SITE		Time Needed: 2+ hours
Field Journal	How Do Researchers Survey Tule Elk? <i>Students complete their field journals by performing various surveys and general observations.</i>	2 hours
Optional Onsite Activity	How Can I Capture My Experiences in a Story, Poem or Drawing? <i>There are many ways to appreciate tule elk; here are some suggestions to foster creativity.</i>	time varies
Optional Onsite Activity	How Can We Inspire Others to Protect Tule Elk and Their Habitat? <i>Classes may choose to videotape segments of field trip to use as a tool for teaching others.</i>	time varies
POST-VISIT		Time Needed: 3+hours
Activity #1	What Can We Learn From Our Field Journals? <i>Students compile data from their field journals to draw conclusions between what they have previously learned in class and what they experienced in the field.</i>	2 hours
Activity #2	How Can I Choose and Complete the Best Stewardship Project for me? <i>Students assess their skills and develop action plans to complete a project that will benefit tule elk and their environment.</i>	time varies



Field Trip Logistics

Teacher Preparation

<i>Things To Remember</i>		
<i>Students need:</i>	<i>Teachers need:</i>	<i>Chaperones need:</i>
<input type="checkbox"/> rain gear	<input type="checkbox"/> rain gear	<input type="checkbox"/> rain gear
<input type="checkbox"/> warm, layered clothes	<input type="checkbox"/> warm, layered clothes	<input type="checkbox"/> warm, layered clothes
<input type="checkbox"/> gloves and hat	<input type="checkbox"/> gloves and hat	<input type="checkbox"/> gloves and hat
<input type="checkbox"/> sunscreen and sunglasses	<input type="checkbox"/> sunscreen and sunglasses	<input type="checkbox"/> sunscreen and sunglasses
<input type="checkbox"/> bag lunch with drink	<input type="checkbox"/> bag lunch with drink	<input type="checkbox"/> bag lunch with drink
<input type="checkbox"/> water	<input type="checkbox"/> water	<input type="checkbox"/> water
<input type="checkbox"/> waterproof boots or tennis shoes	<input type="checkbox"/> waterproof boots or tennis shoes	<input type="checkbox"/> waterproof boots or tennis shoes
<input type="checkbox"/> clipboard with field journal and pencil	<input type="checkbox"/> map with directions	<input type="checkbox"/> map with directions
<input type="checkbox"/> permission slip	<input type="checkbox"/> pencil sharpeners and extra pencils	
	<input type="checkbox"/> teacher backpack and field trip kits from Bear Valley Visitor Center	
	<input type="checkbox"/> first aid kit	
<i>Optional:</i>		
<input type="checkbox"/> small backpack	<input type="checkbox"/> small backpack	<input type="checkbox"/> small backpack
<input type="checkbox"/> binoculars	<input type="checkbox"/> binoculars	<input type="checkbox"/> binoculars
	<input type="checkbox"/> camcorder/ camera	<input type="checkbox"/> camcorder/ camera

Other Things to Remember:

- Bathrooms, drinking water, and the Tule Elk Kit are available at the Bear Valley Visitor Center. This should be your first stop when visiting Point Reyes National Seashore.
- Bathrooms are also available in the McClures Beach parking area, located just below Pierce Point Ranch.
- Drinking water is not available at the Tule Elk Reserve.
- Have students bring a bag lunch if you will be visiting during lunch time.
- If you have a student with accessibility concerns, please call the Park for suggestions.



Evaluation Process



We need your help! Since this guide was designed for your use, only your feedback will make it better. Following the unit overview is a preaddressed evaluation form. Please complete, fold in thirds, affix postage, and drop in the mailbox. In addition to the evaluation forms, we encourage other types of feedback. Please send any of the following items from your students:

1. Videotape or photos of Park field trip
2. Completed student journals
3. Any completed stewardship activities, including posters or newsletters
4. A class portfolio illustrating various pre-visit activities, photographs, or drawings
5. Any completed classroom projects or photographs of projects
6. Other items illustrating student feedback

Please indicate if these items need to be returned. We will use them to create a project library, highlight classroom efforts on our website and in Park publications, and complete evaluations of student outcomes.

Send to: National Park Service
 Point Reyes National Seashore
 Division of Interpretation
 Attn: Education Specialist
 Point Reyes, CA 94956

Reservations

To avoid conflicts with other groups and to be notified about any unusual closures, please call the Park to notify us about your field trip date and time. See the reservation form following this unit overview.

Tule Elk Kit Contents

Kits are available for check out at the Bear Valley Visitor Center. These are available on a first-come, first-served basis.

Tule Elk Kit contents:

- ☐ 20-40 pairs of binoculars
- ☐ 2 spotting scopes
- ☐ 20-40 clipboards
- ☐ thermometers/anemometers
- ☐ 1 teacher backpacks with field guides





California Science Standard Links

Teacher Preparation

	"Investigating Tule Elk" Unit								
	Pre-Visit						On-Site	Post-Visit	
	#1	#2	#3	#4	#5	#6	Field Journal	#1	#2
Sixth Grade									
1									
2									
3									
4									
5	b,e	a,b	b,e				a,b,e	b,e	
6		a							
7	b,c,e		c,d,f	b		b	b,d,f,h	d,e	
Seventh Grade									
1									
2									
3	e	a							
4									
5		a							
6						b,d			
7	a	b,c,e	a,c	a,c		a	a,c,d	c,e	
Eighth Grade									
1									
2									
3									
4									
5									
6									
7									
8									
9	b,g		c	a				b	



Correlations to "A Child's Place in the Environment"
California's State Approved Environmental Education Curriculum



Teacher Preparation

	"Investigating Tule Elk" Unit								
	PRE-VISIT						ON-SITE	POST-VISIT	
	#1	#2	#3	#4	#5	#6	Field Journal	#1	#2
A Child's Place in the Environment: Grade 6 Lessons									
What Are Some Components of an Ecosystem?							X		
What Role Does Diversity Play in an Ecosystem?							X		
How Does the Sun's Energy Flow Through an Ecosystem?									
What Interrelationships and Niches Can Be Identified in an Ecosystem?		X					X		
What Cycles Exist in an Ecosystem and How Do They Sustain an Ecosystem?									
What Examples of Ecological Principles Can Be Observed in an Ecosystem?				X			X		
What Are the Components and Relationships of Human Communities and How Do They Compare to Ecosystems?									
What Are Some Limiting Factors in Human Communities and in Ecosystems?	X						X		
How Do Energy Sources Used in Human Communities Compare to Those Used in Ecosystems?									
How Can Organic Solid Waste in Human Communities Be Composted?									
How is Land Used by Our Community and How Are Land-Use Decisions Made?			X		X			X	
How Can the Disposal of Solid Waste Affect the Quality of the Environment?									
How Does the Motor Vehicle Transportation System Affect the Environment?									
How Do Human Beings Affect Watersheds?							X		
What Human Actions Enhance, Protect, and Sustain the Quality of the Environment?	X				X		X		X
What Have Communities Done to Become More Sustainable?									X
What Projects Can Students Implement to Make Their Classroom and School or Community More Sustainable?	X				X				X



Acknowledgments

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Point Reyes National Seashore: Division of Resource Management

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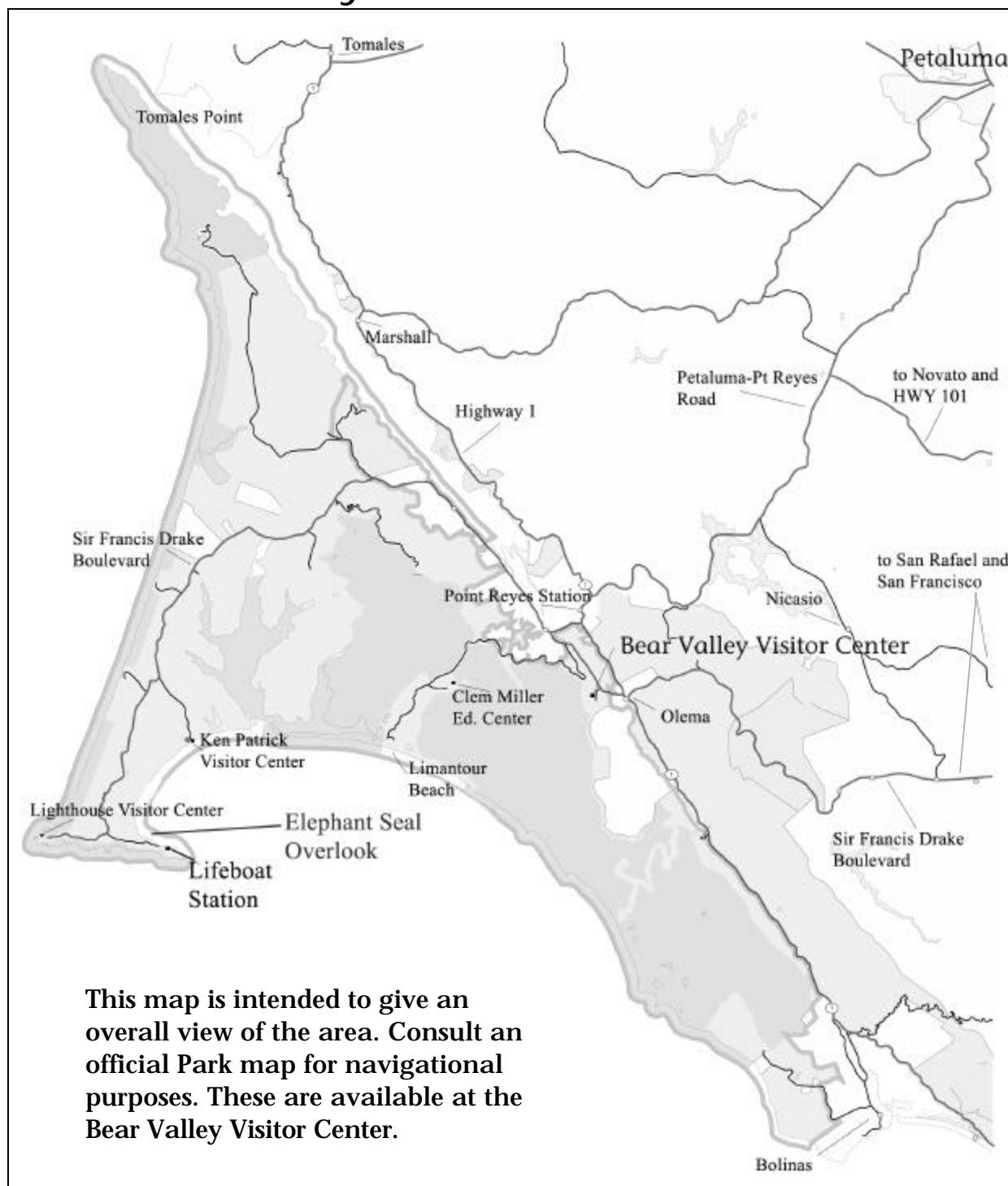
Leon Parson

Christie Denzel Anastasia

Point Reyes National Seashore



Attachment



Approximate Driving Times/Distances

Petaluma to Bear Valley VC	40 min./19 miles
Novato to Bear Valley VC	40 min./19 miles
San Anselmo to Bear Valley VC	30 min./20 miles
Bear Valley VC to Limantour Beach	20 min./9 miles
Bear Valley VC to Tomales Point	30 min./19 miles
Bear Valley VC to Ken Patrick VC	30 min./15 miles
Bear Valley VC to Elephant Seal Overlook	45 min./22 miles

POINT REYES NATIONAL SEASHORE



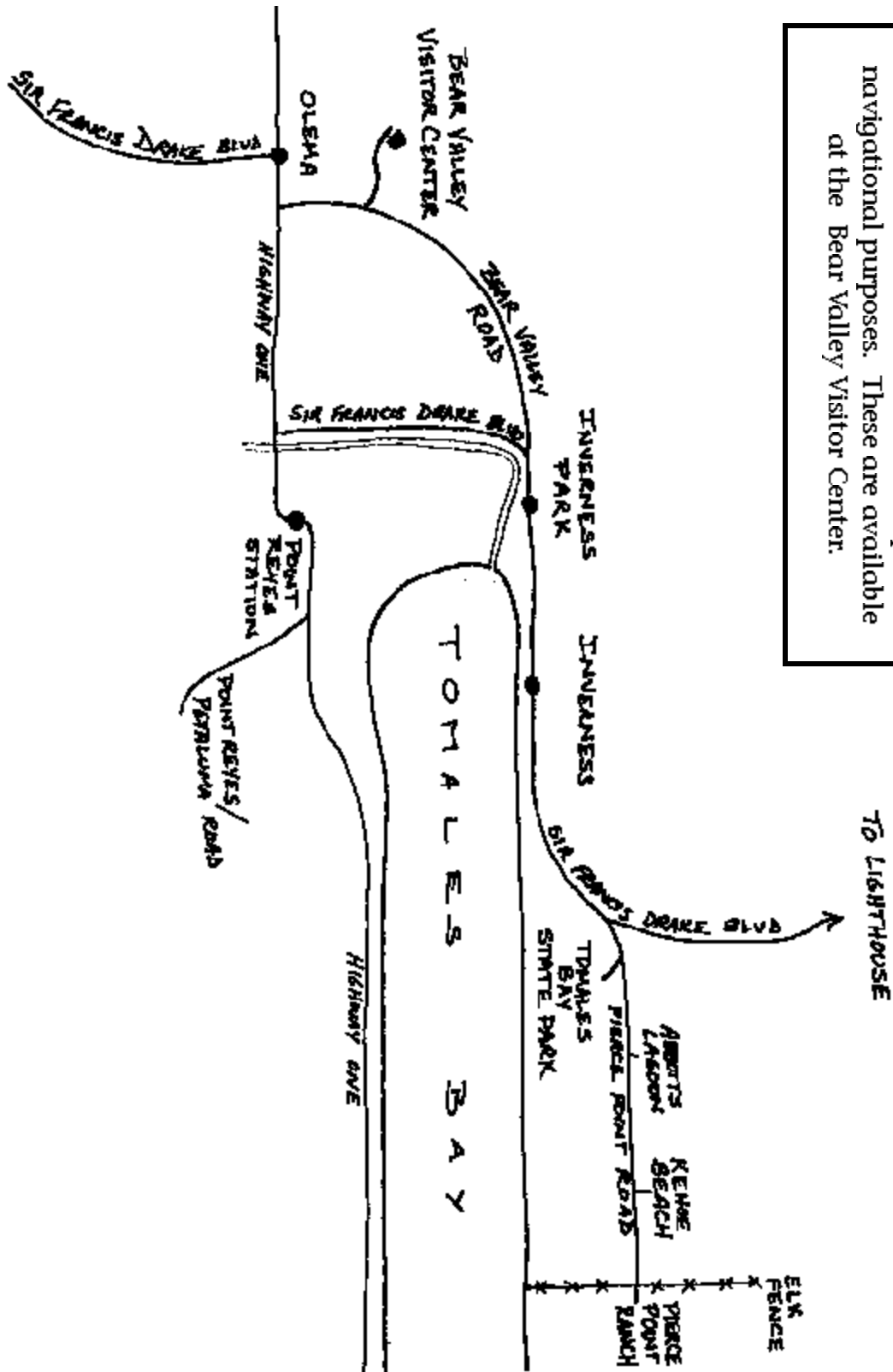


Attachment



Map from Olema to Tomales Point

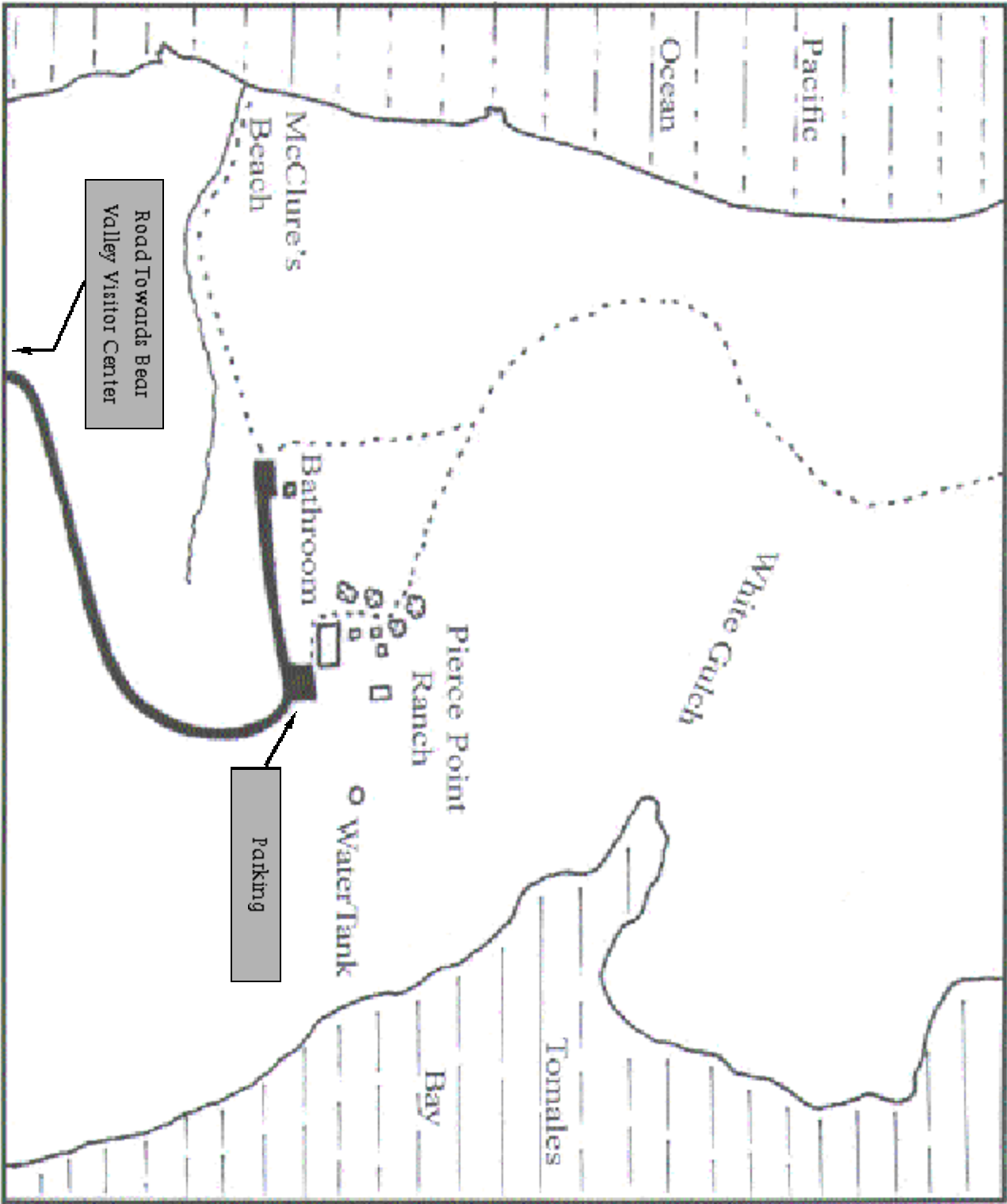
Portions of this map are distorted to allow detail. Consult an official Park map for navigational purposes. These are available at the Bear Valley Visitor Center.



Suggested Area for Tule Elk Field Trip



Attachment

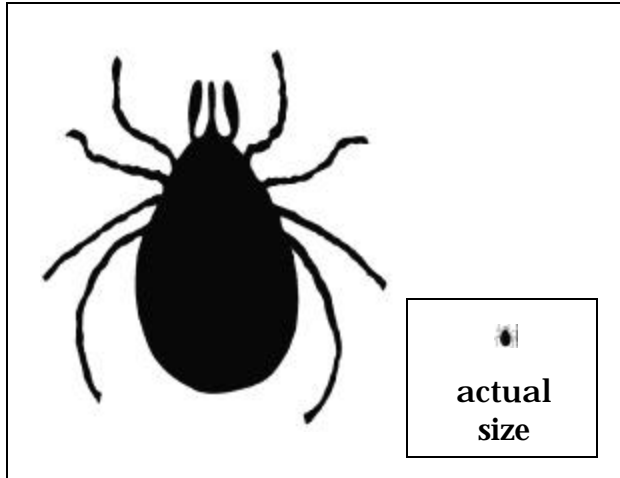


Lyme Disease, Stinging Nettle, and Poison Oak



Attachment

Lyme disease is an illness caused by bacteria transmitted to people by tick bites. Not all ticks carry the disease. Field studies in Marin County show that 1–2% of the western black-legged ticks carry Lyme disease. Since there are several other species of ticks in Marin, the odds of a tick bite producing Lyme disease are less than 1 in 100. Even so, Lyme disease can be severe; it is important to understand the prevention and symptoms.



Symptoms:

arthritis and joint pain
lethargy
heart problems
pain/limping
fever
kidney problems
depression
bull's-eye rash (50% of victims)

Tick species in California include:

Western black-legged tick and Pacific coast tick (West Coast)
Lone star tick and American dog tick (throughout U.S.)

How to avoid tick bites:

- Wear light-colored, long-sleeved clothes so you can see the ticks more easily.
- Tuck shirt into pants and pants into socks to keep ticks away from your skin.
- Stay on trails.
- Apply an insect repellent, labeled for ticks, to shoes, socks, and pants.
- Check yourself completely after a hike. Closely check any skin irritation. Ticks anesthetize the skin before biting so you'll seldom feel the original bite.

What to do if bitten:

- Use tweezers to grasp tick at point of attachment, as close to skin as possible. Gently pull tick straight out.
- Save tick, notify your doctor.
- Don't panic— ticks need to be embedded from 24 to 48 hours to transmit bacteria. The ticks that transmit Lyme disease are usually in a developmental phase in which they are smaller than the head of a pin.

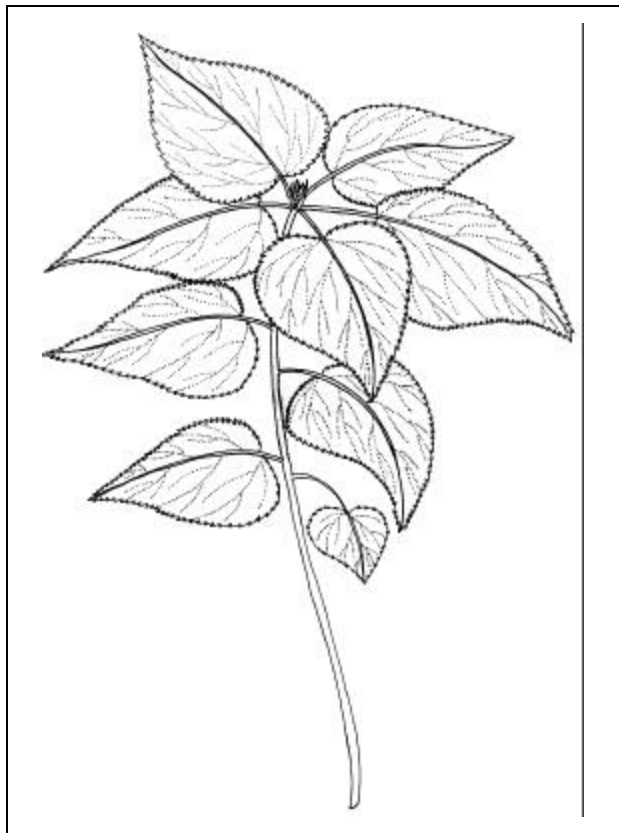
References:

Ticks and Lyme Disease in the National Parks
Lyme Disease Foundation/www.lyme.org



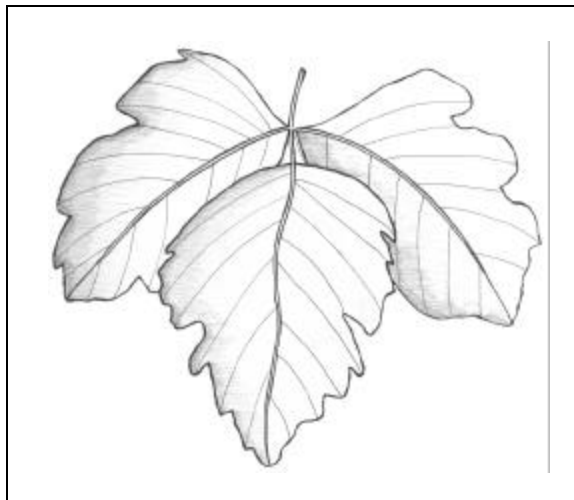
Lyme Disease, Stinging Nettle, and Poison Oak (continued)

Attachment



Stinging nettle is native to Europe, but grows at Point Reyes National Seashore. It can cause a painful rash that stings for up to 12 hours after brushing up against the plant. A topical analgesic (used to treat poison ivy or bug bites) can be applied to help alleviate the sting. Study the picture and have someone point out the plant in the Seashore to aid in its identification.

Poison oak usually causes an itchy rash if you are sensitive to it. You can get a rash by touching the plant, its leaves, or its roots. You can also contract poison oak by petting your dog (if the oils are on its coat) or by touching clothing that has touched poison oak. Rashes may occur several days after the initial contact with the plant. Severe rashes may affect the lungs. If you have difficulty breathing, call 911 or go to the nearest emergency room immediately. Preventive topical ointments are available to help avoid reactions to poison oak. Learn to recognize the compound leaves with a shiny appearance.



Creating Coastal Stewardship through Science



Reservation

If you are planning a trip to Point Reyes National Seashore to use this curriculum, please notify the Park to avoid scheduling conflicts with other groups and to be notified of any unusual closures. Mail this form at least 2 weeks in advance (fold in thirds and affix postage) or call (415) 464-5139 to leave a message.

Teacher Name: _____

School Name: _____

School Address: _____

City/State: _____ Zip Code: _____

School Phone: _____ School Fax: _____

Email: _____

Grade: _____ Class Size: _____

Home Phone: _____

Field Trip Options

Monitoring Creek Health

Observing Pacific Gray Whales

Discovering Northern Elephant Seals

Defining Habitats

Investigating Tule Elk

Uncovering the San Andreas Fault

Identifying Resident Birds

Field Trip Preferences

Field Trip Topic	Dates (list three in order of preference)	Time
1. _____	_____	_____
	_____	_____
	_____	_____
2. _____	_____	_____
	_____	_____
	_____	_____

Comments _____

_____ Confirmation Letter

_____ Materials Sent



**National Park Service
Point Reyes National Seashore
Division of Interpretation
attn: Education Program Coordinator
Point Reyes Station, California 94956**

Creating Coastal Stewardship through Science

Please help us develop and improve our programs by taking a few minutes to complete this form. This evaluation form is preaddressed, but needs to be folded in thirds and stamped with postage. If you prefer, e-mail comments to:

PORE_Education@nps.gov



Evaluation

Name: _____ School Name: _____

School Address: _____

City/State/Zip Code: _____

School Phone: _____ School Fax: _____

Email: _____

Class Size/Grade: _____

Date of Visit: _____ Program/Location: _____

Getting Your Visit Set Up

Do you have any suggestions to make logistics easier? (maps, directions, reserving programs)

Curriculum Materials

Which lessons were the most effective?

Relevance of content to your students and curriculum:

Grade appropriateness?

Program Assessment

How does this program fit into California/National Standards and your personal education program?

Strengths/weaknesses of program?

Best part of experience?

What is the level of support at your school for this program?

What could the National Park Service do to improve your education program?

Overall, how would you respond if a colleague asked about this program?

Highly recommended Recommended Recommended with some qualifications
Not recommended



**National Park Service
Point Reyes National Seashore
Division of Interpretation
attn: Education Program Coordinator
Point Reyes Station, California 94956**



Adaptation	a trait that increases the ability of an organism to survive in its environment
Advocacy	the active support of a cause
Annual life cycle	the physical stages that influence elk behaviors each year
Antlers	fast-growing bone that is shed each year; grown by male members of the deer family and also by female caribou
Bachelor group	three or more bull elk "hanging out" together with no females
Behavioral adaptation	a behavioral trait that increases the ability of an organism to react and survive in its environment
Peter Behr	California State Senator (1970-1978) who was instrumental in protecting tule elk. He was also instrumental in establishing Point Reyes National Seashore
Behr Bill	established in 1971 and named after its author, Peter Behr. This bill prohibited hunting tule elk until their population numbered 2,000
Biodiversity	the variety of life forms in a given area
Birth control	method of deliberately limiting the number of offspring born
Browse	(noun): parts of woody plants; (verb): to eat parts of woody plants
Bugle	the high-pitched whistling sound made by bull elk during rut
Bull	an adult male elk
Calf	a baby elk
Carrying capacity	the maximum number of individuals of a population that a habitat can support
Cervidae	the scientific name for the deer family
<i>Cervus elaphus nannodes</i>	the scientific name for tule elk genus, species, and subspecies
Competition	the struggle among organisms, both of the same and of different species, for food, space, and other vital requirements



Vocabulary

Conservation	the controlled use and protection of natural resources
Consumer	a living thing that eats other living things (plants and animals)
Contraception	a method of avoiding pregnancy by preventing fertilization
Cow	an adult female elk
Diversity	variety, distinct in kind
Ecology	the study of interrelationships between living organisms and their environment
Ecosystem	a natural unit of living things and their environment linked together by energy and nutrient flow
Enclosure	a fenced area intentionally established to confine tule elk in the Tomales Point area
Endangered	faced with the possibility of extinction
Environmental assessment	a federally-required study which looks at the impacts of certain predetermined activities on the environment
Estrus	the regularly recurring period of ovulation and sexual receptivity in female mammals
Exclosure	a fenced-in area constructed to restrict elk from grazing vegetation; used by researchers to determine grazing effects of elk on vegetation
Extinct	having no members of the species or family in existence, as is the case with many organisms known only from fossils
Food chain	the pathway of food and energy through an ecosystem
Food pyramid	a diagram used to illustrate a system of food relationships, biomass, and balance
Forage	(noun): vegetation eaten by herbivores; (verb): to search for and eat food
Forbs	low growing, soft-stemmed plants
Gestation	the time between fertilization and the birth of an offspring



Vocabulary

Graze	to eat grass or forbs
Guard hairs	long, coarse hairs that protect undercoat
Habitat	the food, water, shelter, and space an animal requires; the place in an ecosystem where populations of an organism live and grow
Harem	a group of elk during rut, usually consists of cows, calves, and one mature bull
Herbivore	an animal that eats plants
Herd	animals of one species that remain together as a group: a herd of tule elk (or elephants, deer, cattle, etc.)
Immuno-contraception	a form of contraception that stimulates the immune system to produce antibodies preventing fertilization
Incidence	an occurrence, act, or instance
Intrusive	causing a disturbance or having an unpleasant effect
Keratin	a tough protein substance that forms structures such as hair, nails, horns, hoofs, and baleen
Migration	travel in seasonal movements
Miller, Henry	the owner of the land where the remaining tule elk were found in 1874. The entire population of tule elk today are descendents of those few elk
Molt	to shed winter hair
Mission	overriding goal or strategy used for management.
National Park Service	the government organization that manages the National Park System
National Park System	a collection of over 380 sites across the United States managed under one mission by the National Park Service.
Native	originally belonging to a specific place
Necropsy	the examination of a dead animal's body



Vocabulary

Physical adaptation

a physical trait that increases the ability of an organism to react and survive in its environment

Poacher

someone who kills animals illegally or steals resources such as antlers

Posturing

a characteristic way of carrying one's body, possibly to convey a message to another individual

Predator

an animal that kills and eats other animals

Prey

an animal that is killed and eaten by other animals

Preservation

the act of protecting and keeping in unaltered condition

Primary bull

the dominant bull; the one that breeds with the most cows in a harem

**Public Law
94-389**

the legislation directing the federal government to make suitable lands available for "the preservation and grazing of the tule elk"

Radio collar

a radio-signal device fitted around the neck of an animal to enable researchers to determine its location

Radio telemetry

a method used to track and locate individual animals fitted with radio collars

Rehabilitation

restoration; bringing back to a good condition

Relocation

moving or being moved to a new place on a long-term basis

Research

scholarly or scientific investigation

Resource

portion of an environment available for use by an organism

Restoration

putting something back into a prior position, place, or condition

Ruminant

an ungulate having a multichambered stomach that digests plant fibers by chewing cud (regurgitated, partially digested food) (Example: cattle, sheep, goats, deer, giraffes)

Rut

the mating season for elk





Secondary bulls	after the primary bull is tired and eventually defeated, these bulls split the harem and become masters of their own smaller herds
Sexually mature	physically and emotionally capable of sexual activity
Social behavior	interaction between animals: nursing, fighting, communicating, etc; can be between same or different species
Species	the fundamental category of classification, ranking after a genus, consisting of organisms capable of interbreeding
Sterilization	the procedure of rendering an organism incapable of sexual reproduction; making infertile
Stewardship	making choices and taking action to protect our environment
Subspecies	a category used to classify plants and animals whose populations are distinct (for example, in distribution, appearance, or feeding habits), but can still interbreed
Surpass	to go beyond what is expected or hoped for, usually by being bigger, better, or greater
Symmetry	balanced arrangement of parts on opposite sides of a line
Tante	Coast Miwok word for elk
Thrash	to tear at, as elk do to vegetation with their antlers
Thrive	to grow well, to grow vigorously
Toxin	a poisonous substance
Ungulate	a mammal with hooves
Velvet	the protective skin, rich in capillaries, that covers and supplies nutrients to antlers as they grow
Vitality	the capacity to live, grow, or develop (what distinguishes the living from the nonliving)
Vocalization	an oral sound, usually produced to communicate
Wapiti	Shawnee word for elk, meaning "white rump"
Wild	living in a natural state; not domesticated

**Wildlife
management**

the application of scientific knowledge and technical skills to protect, preserve, conserve, limit, enhance, or extend the value of wildlife and its habitat

Yearling

an animal between the ages of 1 and 2 years



Investigating Tule Elk

Pre-Visit Activities

How Can We Learn About the Return of Tule Elk?	29
What Is a Tule Elk?	49
How Is Tule Elk Research Done?	67
What Can We Expect on Our Field Trip to the Tule Elk Reserve?	81
Safety and Stewardship Challenge	87
How Do I Use Binoculars?	97

How Can We Learn About the Return Of Tule Elk?



Students read *Tule Elk: The Return of a Species* to begin their understanding of elk and their place in the Point Reyes ecosystem. Two activity sheets can be used to assess reading comprehension and/or incorporate math into science. Understanding of the basic ecology of tule elk will be critical to the success of your students' field visit to Tomales Point.

Time required: 2 hours

Location: classroom or homework

Suggested group size: individual work or pairs

Subjects: science, history, math

Concepts covered: population dynamics, human ecology

Written by: Stephanie Stiller, Hill Middle School, Novato
Melinda Repko and Kim Linse, Point Reyes National Seashore

Last updated: 03/26/00

Pre-Visit Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Understand the importance and role of tule elk within Point Reyes National Seashore.
- Understand how natural and human activities relate to animal populations.
- Complete activity sheets based on comprehension of the tule elk newspaper.

California Science Standard Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

- 6th grade 5b - organisms and physical environment
 5e - numbers and types of organisms an ecosystem can support depends on the resources available
 7b - appropriate tools and technology to perform tests, collect and display data

POINT REYES NATIONAL SEASHORE

Creating
COASTAL
STEWARDSHIP
through Science





7c - develop qualitative statements about the relationships between variables

7e - recognize whether evidence is consistent with a proposed explanation

7th grade 3e - extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival
7a - select and use appropriate tools and technology to perform tests, collect and display data

8th grade 9b - evaluate the accuracy and reproducibility of data
9g - distinguish between linear and nonlinear relationships on a graph of data

National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Think critically and logically to make the relationship between evidence and explanations; use mathematics in all aspects of scientific inquiry.
- Content Standard C - Populations and ecosystems.
- Content Standard F - Science and technology in society.

Materials

To be photocopied from this guide:

- **Pre- and Post-Evaluation** Activity Sheet
- *Tule Elk: The Return of a Species* Newspaper
- **The Return of a Species** Activity Sheet
- **Population Growth** Activity Sheet
- **Vocabulary** sheets located in Teacher's Preparation/Attachments

Vocabulary

birth control, contraception, extinct, intrusive, Public Law 94-389, relocation, sexually mature, subspecies, surpass, thrive, yearlings

Procedures

1. Pre- and Post Evaluation

Distribute Pre- and Post-Evaluation activity sheets. Remind students this is not a graded test, but rather a measure of our success; each student will retake the same test after several lessons. (Note: You may choose to save these completed tests and redistribute in the first post-visit lesson. Students can change their answers based on what they have learned.)

2. Distribute Newspaper

Each student will need a copy of the newspaper, *Tule Elk: The Return of a Species*. Students can work in pairs or individually to complete activities.

3. Reading Comprehension

Read the *Tule Elk: The Return of a Species* newspaper as a class or individually and discuss some of the major concepts.



4. Activity Sheets

Give each student the appropriate activity sheets, vocabulary list, and instructions for completion.

5. Conclusions

Review students' answers and relate these concepts to lessons already covered earlier in the year.

Extension Ideas

1. Using charts and graphs in the tule elk newspaper, have students speculate tule elk behaviors and activities that they may observe on their field trip.
2. Write an essay from the perspective of one of the tule elk living in the last known herd in 1874. Why are all of the tule elk disappearing? What do you need to survive? What would you say to Henry Miller? What would you say to the ranch worker that found you?
3. Provide students with Internet addresses listed in the Resources at the back of this guide. Encourage students to generate questions and seek answers.



Pre- and Post-Evaluation

Complete the Sentences

Choose the best word to complete the sentences below:

Behr Bill	endemic	immunocontraception	6 to 10
antlers	horns	sterilization	extinct

1. The **Behr Bill** gave tule elk official federal protection.
2. Occurring nowhere else, the tule subspecies of elk are **endemic** to California.
3. Scientific approach to managing the elk involves continuation of research, relocation, and **immunocontraception**.
4. A female tule elk is likely to have **6 to 10** calves in her lifetime.
5. Male elk have **antlers**, made of bone, which are shed and regrown annually.

You Be the Planner

Indicate which category the following management actions would fall under: research, relocation, or immunocontraception.

relocation	Seventy elk moved to Limantour
immuno.	Form of contraception
research	Explore methods to manage elk population
immuno.	Produce antibodies that block sperm from attaching to ovum
research	Monitor environmental availability of food and water, predators, diseases, reproduction, and habitat
relocation	Establish new herds
research	Study tule elk ecology and population
immuno.	Administered in a dart

Elk Facts: True or False

True Calves are born after 8.5 months.gestation.

True Average life span of wild elk is 12 years.

False Tule elk at Point Reyes National Seashore are threatened by many predators, including the grizzly bear.

False Both female and male tule elk have horns.

National Park System

List at least three units of the National Park System:

Point Reyes National Seashore, Golden Gate National Recreation Area, Muir Woods National Monument, John Muir National Historical Site, Yosemite National Park, Grand Canyon National Park, Washita National Battlefield

Stewardship

What can you do to support preservation of the elk population?

List ideas on the back of this paper.

Name _____ Date _____



Pre- and Post- Evaluation

Complete the Sentences

Choose the best word to complete the sentences below:

Behr Bill	endemic	immunocontraception	6 to 10
antlers	horns	sterilization	extinct

1. The _____ gave tule elk official federal protection.
2. Occurring nowhere else, the tule subspecies of elk are _____ to California.
3. Scientific approach to managing the elk involves continuation of research, relocation, and _____.
4. A female tule elk is likely to have _____ calves in her lifetime.
5. Male elk have _____ made of bone, which are shed and regrown annually.

You Be the Planner

Indicate which category the following management actions would fall under: research, relocation, or immunocontraception.

- _____ Seventy elk moved to Limantour
- _____ Form of contraception
- _____ Explore methods to manage elk population
- _____ Produce antibodies that block sperm from attaching to ovum
- _____ Monitor environmental availability of food and water, predators, diseases, reproduction, and habitat.
- _____ Establish new herds
- _____ Study tule elk ecology and population
- _____ Administered in a dart

Elk Facts: True or False

- T/ F Calves are born after 8.5 months gestation.
- T/ F Average life span of wild elk is 12 years.
- T/ F Tule elk at Point Reyes National Seashore are threatened by many predators including the grizzly bear.
- T/ F Both female and male tule elk have horns.

National Park System

List at least three units of the National Park System:

Stewardship

What can you do to support preservation of the elk population?
List ideas on the back of this paper.

Tule Elk

The Return of a Species

Sailing past the Point Reyes peninsula in the year 1800, explorers saw large herds of elk roaming through open grasslands. Sixty years later, the elk were gone from Point Reyes and by 1870 they were thought to be extinct statewide. Today, elk again roam along the hills of Tomales Point and several other areas within California. This is the story of their remarkable comeback.



Historic
Tule Elk Range
Population: 500,000



1870
Population: fewer than 10



1998
Population: 3,200

A Look into the Past

The tule elk (*Cervus elaphus nannodes*) is a subspecies of elk native to California. It occurs nowhere else. For thousands of years, as many as 500,000 tule elk thrived in California from the lush open country of the Central Valley to the grassy hills on the coast. But following the Gold Rush of 1849, the elk were hunted nearly to extinction. At the same time, elk habitat was converted to agriculture, and livestock grazed what had been elk forage. These developments caused the elk's decline and nearly caused their extinction.

Imagine the surprise of the ranch workers in 1874 who discovered several tule elk while draining a marsh to create agricultural fields. Not a single tule elk had been seen for four years! Fortunately the landowner, Henry Miller, felt compelled

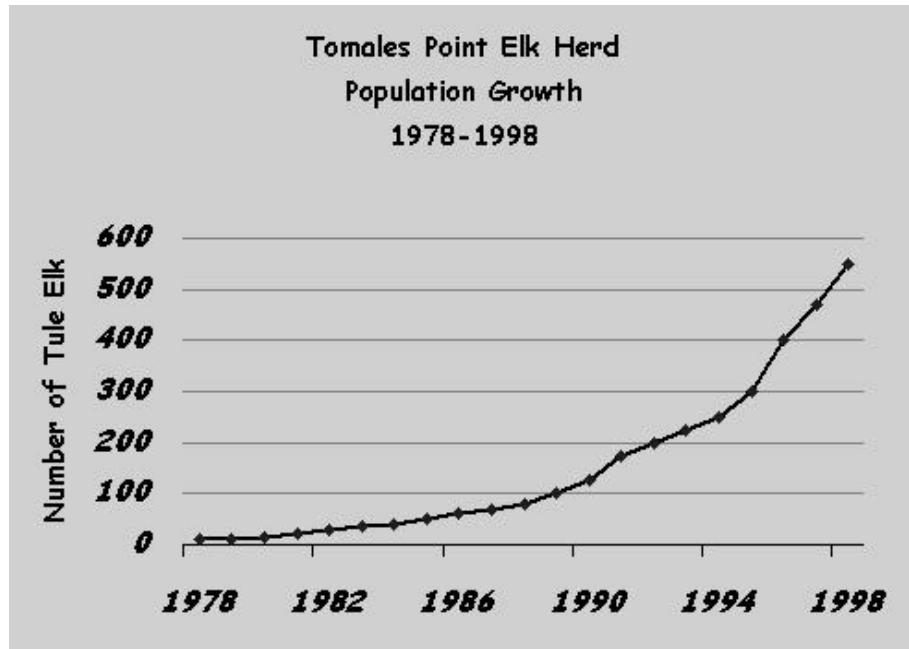
to protect these last elk, and by 1905 their population had grown to 140. When the elk began to eat Miller's crops and trample his fences, he captured some and moved them to other locations in California. This was the first time the elk were moved for conservation purposes. It was not to be the last.

Revival and Recovery

Tule elk received official protection in 1971 with state Senate Bill 722, called the Behr Bill after its author, Peter Behr. This bill prohibited hunting of tule elk—then numbering 500—until their population reached 2,000. As a result of management by the California Department of Fish and Game, the tule elk population grew to 2,000 in 1989. By 1998, there were more than 3,000 elk in California.



The Return of a Species



In 1976, Public Law 94-389 directed the federal government to make suitable lands available for “the preservation and grazing of tule elk.” Two years later, ten tule elk were moved to Tomales Point, the northernmost part of Point Reyes National Seashore. There they survived a decade of drought. With the return of the rains in the early 1990s, range conditions improved dramatically and the elk herd grew rapidly. By 1998, the herd size surpassed 500 animals, one of the largest of the 22 herds currently in the state.

A Challenge for the Future

Today’s tule elk population is larger than it has been for 130 years: 3,200

and growing. California’s human population, now approximately 32 million, is also growing. As the human population expands, wildlife habitat is being converted to human habitat – housing, stores, schools, and highways. As a result, the elk have fewer and fewer places to roam. Tule elk will probably never return to their historic numbers nor to all of their historic range because of this human growth and lack of suitable elk habitat. But if they and other wildlife are to survive, human expansion into the landscape must be balanced with the need to maintain the treasured open spaces of California.

“We are the only species which, when it chooses to do so, will go to great effort to save what it might destroy.”

Population Growth and Range Limitations

Since their reintroduction to the Point Reyes Peninsula, the tule elk have lived within a 2,600-acre reserve at Tomales Point. Their range is restricted by the Pacific Ocean to the north and west, Tomales Bay to the east, and a three-mile-long, ten-foot-tall fence to the south. Given the mild climate and lush habitat of Tomales Point, the elk live in a virtual paradise. As long as there is abundant rainfall and forage, they will continue to multiply.

Vitality and youth characterize the existing herd, as more than half the animals are less than five years old. Several hundred of the females are old enough to reproduce.

Fewer than 5 percent of the elk die each year; they have an average life span of twelve years. As the herd grows within the restricted Tomales Point area, they place a greater demand on their habitat. Without adequate rainfall, their forage could become deficient, causing them to suffer stress, starvation, and eventually a population crash.



Management Actions

Research

The Seashore will continue its intensive research effort, studying tule elk ecology and population dynamics. Researchers will explore methods to alter elk population size where and when necessary, look at abundance of food and water, predation, disease, and population control techniques. This research information will help the Seashore revise the management plan to accommodate new situations and changing conditions.

Relocation

As a scientific trial to establish the effectiveness of expanding their habitat, up to 70 elk have been moved to the Limantour wilderness area from the existing herd at Tomales Point. Working with other agencies, the Seashore will seek to relocate elk elsewhere in the state to establish new herds in the historic range.

Immunocontraception

Based on the recommendations of three scientific panels, the Seashore is studying a form of contraception called immunocontraception within the Tomales Point herd. The immunogen, administered in a dart, works by stimulating the cow's immune system to produce antibodies that block sperm from attaching to the ovum. This contraceptive is reversible and antibodies resulting from the vaccine do not pass through the food chain. This means there is no known environmental byproduct—no other plants or animals will be affected in any way. Annual booster shots may be necessary before the next breeding season. In August 1997, the Seashore began a pilot study of immunocontraception. Research will determine if this “elk birth control” can be used effectively with the future relocated elk population at Point Reyes National Seashore.

Elk add diversity and beauty to the Point Reyes Peninsula, restore the natural and cultural character of the land, and enrich our lives. As a result, we must be committed to making responsible choices that ensure the elk's survival.

The Point Reyes Solution

Since 1993, researchers and biologists from the National Park Service, U.S. Geological Survey, University of California at Davis and Berkeley, Humboldt State University, and the California Department of Fish and Game have studied the complex question of how to accommodate the growing elk herd. They looked at the herd's composition and size, incidence of disease, impact on endangered species, and the condition of the plant communities on Tomales Point. These studies provided the information necessary for the Park to develop a management plan to ensure the health of the herd.

After consideration of a number of alternatives and public review, the Park is implementing a scientific approach to manage the tule elk herd. The approach involves three major components: the continuation of research, relocation, and immunocontraception.

In the environmental assessment, several other options were explored but rejected:

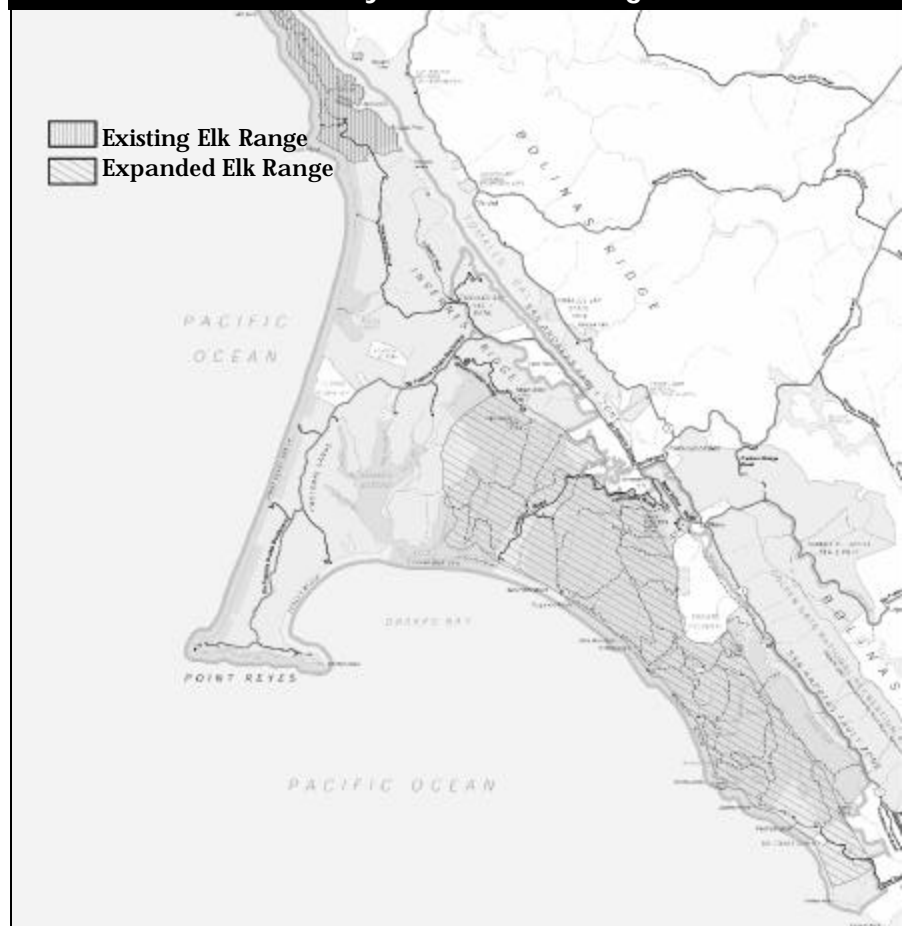
- Sterilization was eliminated as an option because of its irreversibility and its intrusive, inhumane implications.
- Due to possible disease transmission

and competition with cattle for forage, removing the elk fence at Tomales Point will not be considered as long as the adjacent dairy ranches are in operation.

- In order to leave the wildlife wild, the Park will not attempt to establish new herds that require permanently fenced, restricted ranges.
- Hunting elk within the Park is not an option because of strong public opposition and safety concerns.



Point Reyes Tule Elk Ranges



Elk Facts

Life Cycle

Female elk are sexually mature by two years of age, although they may be able to breed as yearlings. Nearly all female elk will reproduce during their lifetime. A female is likely to have six to ten calves in her lifetime. Males are sexually mature at age two, but usually aren't able to breed until they are strong enough to compete with other bulls to defend a harem of cows. Half the the male population will remain bachelors; most breeding is accomplished by ten percent of the male population.

Gestation period: Calves are born 8.5 months after conception. They nurse for four or five months, but start nibbling on grass when they are less than one month old.

Lifespan: Twelve years is an average lifespan for wild elk; some elk have been known to live 25 years in captivity.

Predators

The tule elk at Point Reyes National Seashore are practically free from predators.

Humans could kill elk with weapons, but hunting is not allowed in the Seashore.

Black and grizzly bears usually eat plants, but they would eat elk too. However, there are no longer bears in the park.

Coyotes are found at the Seashore, and will kill elk calves, but an elk's flailing hooves can easily kill a coyote. No coyote attacks on elk have been recorded in the Seashore.

Mountain lions can kill elk of any age, but find smaller deer an easier target. No mountain lion interactions with elk have been documented in the park.



Antlers vs. Horns

Antlers are often confused with horns. Horns are slow-growing and permanent, usually grown by both sexes, and are made of a bone core covered by a thin layer of keratin.

Antlers usually grow only on males and are made completely of bone. They are shed and regrown annually. In the spring, they are covered with "velvet," a system of blood vessels that nourish the bone as it grows. A set of elk antlers can weigh up to 40 pounds.

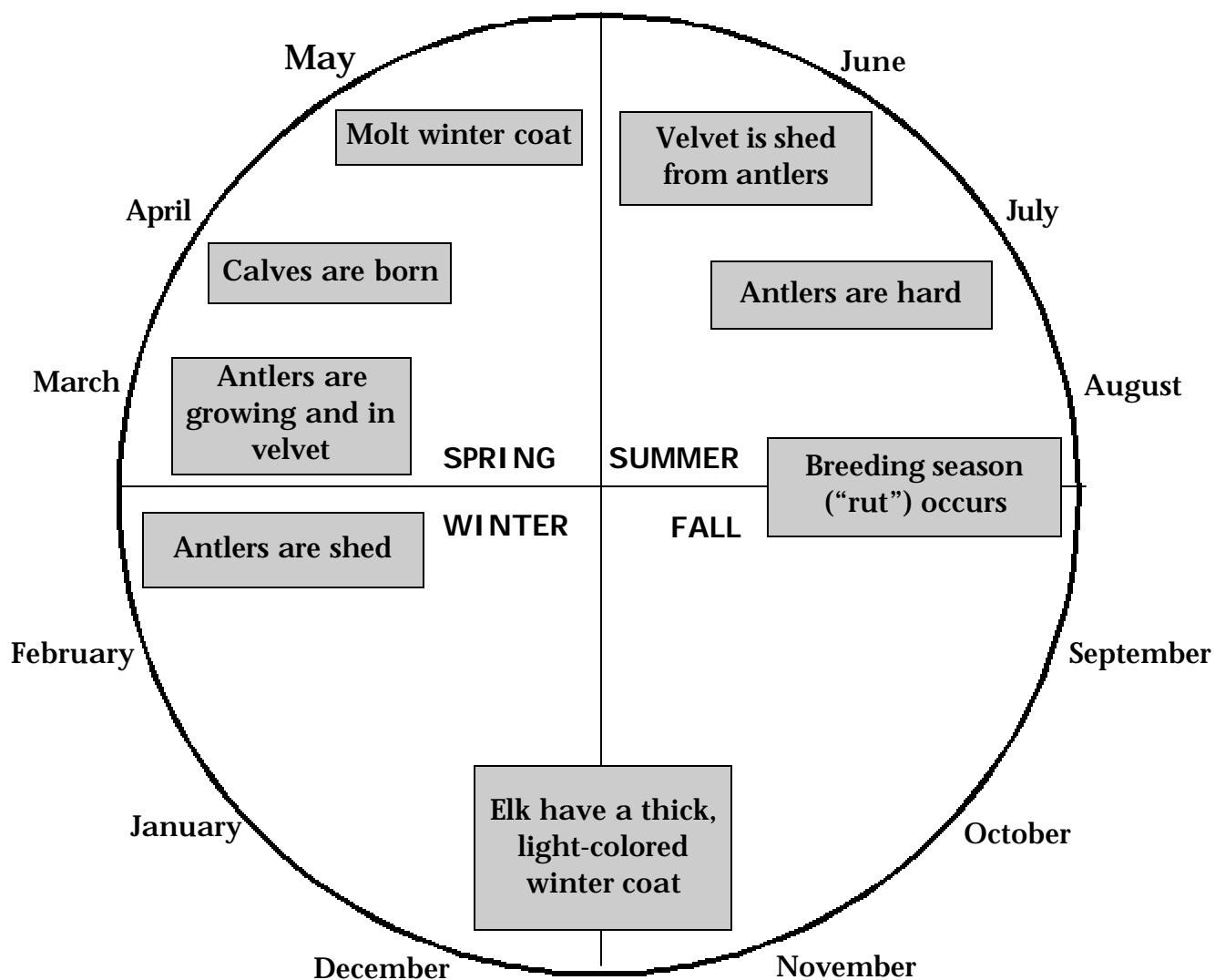
The size and symmetry of the antlers reflect the health as well as the age of the animal. A "spike bull" is less than two years old and has only one point on his antlers. Older bulls have more

points, but they do not grow a point for each year of age.

Antlers are used as weapons by the males to compete for the chance to breed. A young bull is easily intimidated by a mature bull's large rack of antlers. Two evenly matched bulls may use their antlers in combat, if other attempts at intimidation (vocalizations and posturing) have failed.

A bull who has proven himself bigger and stronger than the others defends a harem of up to 30 females. This means he is the primary bull, responsible for 80 percent of the breeding. Towards the end of the breeding season, other "secondary" bulls may get the opportunity to breed as the primary bull tires.

Annual Life Cycle of Tule Elk



	Winter/Spring	Summer/Fall
Population Groupings	cows, calves, yearlings	harems (one adult bull with cows, calves, and yearlings)
	bachelor groups (all adult bulls) lone bulls	bachelor groups lone bulls

Elk Watching Tips

- For your own safety, always observe elk from a distance. Use binoculars and spotting scopes. If an elk becomes alert or nervous and begins to move away, you are too close.
- If viewing from your car, pull off the road or park in designated areas.
- If you are on foot, stay on the trail; do not come between a cow and calf, a bull and a group of cows, or two bulls challenging each other.
- Watch quietly; whisper. Move slowly.
- Do not feed the elk. Feeding elk or any other wildlife is unhealthy for the animals, potentially dangerous for visitors, and strictly prohibited.
- Ride your bicycle only on designated trails.
- Bring your pets only where they are allowed.
- Do not collect or remove elk antlers. They are an important source of calcium for many wildlife species such as rodents and deer.

How You Can Help the Elk

A number of organizations are concerned about the welfare of elk in California and throughout the U.S.A. They provide a range of services, from educational materials to buying and managing land for elk habitat. You can get involved in a number of ways, among which are the following:

- ☐ Donate—Give to and help raise money for agencies and nonprofit groups that protect habitat.
- ☐ Protect Habitat—Prevent domestic dogs from roaming. Follow Park regulations and guidelines listed here and at trailheads.
- ☐ Learn—Find out more about elk from the organizations listed below. Share information with friends and family.
- ☐ Volunteer—Be an elk docent on summer and fall weekends at Point Reyes National Seashore. Call (415) 464-5195, for an application.

National Park Service 1998

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NP-7

Tule Elk Newspaper Activity
The Return of a Species



Activity Master

Answer the following questions based on information in the newspaper, your ideas, and your understanding.

A Look into the Past

1. What happened to the tule elk population after the Gold Rush of 1849?
The population dropped from 500,000 to 10.
2. What happened in 1874 that significantly affected tule elk?
Ranch workers discovered several tule elk and the landowner protected them.

Revival and Recovery

3. What officially protected tule elk? When?
The Behr Bill officially protected them in 1971.

The Point Reyes Solution

4. It is legal to hunt tule elk in some areas; however, hunting tule elk is not permitted at Point Reyes National Seashore. What threats exist for elk at Point Reyes? Can anything be done to prevent some of these threats?

Disease, restricted habitat, and overpopulation all influence population numbers at Point Reyes. Research and medication can help prevent disease. Establishing free-ranging herds, like the one near Limantour Beach, can expand the habitat for the tule elk at Point Reyes. Immunocontraception and relocation can help control overpopulation.

5. Does their reintroduction into Point Reyes National Seashore help provide a better future for tule elk in California? How?

Yes. The herd at Point Reyes is the second largest in the state. Point Reyes provides good habitat and protection, enabling the population to continue to recover.



Tule Elk Newspaper Activity
The Return of a Species

Activity Master

6. What options are being considered at Point Reyes to manage the population of the Tomales Point herd? Compare the positive and negative impacts.

Option	Positive	Negative
1. immunocontraception darting	reversible; does not affect the food chain	requires annual darting
2. relocation	establishes a free- ranging herd	expensive; requires difficult capture techniques; few relocation sites available
3. research	gives management information to make informed decisions	expensive and staff intensive; must ask the right questions to get answers that will help the most in decision making; takes time
4. natural regulation	true to natural ecosystem functioning less time intensive	outcomes unpredictable
5. culling (lethal removal)		

Making Responsible Choices for the Future

7. If you were the Superintendent of Point Reyes National Seashore, what option(s) (listed above) would you choose? Why?

Answers will vary

8. What do you think will happen to the tule elk population in the next 10 years? Why?

Answers will vary; it may continue to grow until the population crashes, a drought may limit reproduction, relocations of elk may continue, immunocontraception may become effective.

Name _____ Date _____



Tule Elk Newspaper Activity
The Return of a Species

Answer the following questions based on information in the newspaper, your ideas, and your understanding.

Activity Sheet

A Look into the Past

1. What happened to the tule elk population after the Gold Rush of 1849?
2. What happened in 1874 that significantly affected tule elk?

Revival and Recovery

3. What officially protected tule elk? When?

The Point Reyes Solution

4. It is legal to hunt tule elk in some areas; however, hunting tule elk is not permitted at Point Reyes National Seashore. What threats exist for elk at Point Reyes? Can anything be done to prevent some of these threats?
5. Does their reintroduction into Point Reyes National Seashore help provide a better future for tule elk in California? How?





Name _____ Date _____

Tule Elk Newspaper Activity
The Return of a Species

Activity Sheet

6. What options are being considered at Point Reyes to manage the population of the Tomales Point herd? Compare the positive and negative impacts.

Making Responsible Choices for the Future

Option	Positive	Negative
1.		
2.		
3.		

7. If you were the Superintendent of Point Reyes National Seashore, what option(s) (listed above) would you choose? Why?

8. What do you think will happen to the tule elk population in the next 10 years? Why?



What Is a Tule Elk?



Students will research and present information about adaptations, behaviors, and life cycles of tule elk. Students will also discover connections between seasons and behaviors to predict observations during their upcoming visit to Point Reyes National Seashore.

Time required: 2 hours

Location: classroom/homework

Suggested group size: pairs

Subject: science

Concepts covered: ecology, biology, animal behavior

Written by: Beverly Lindquist, Cooper Elementary, Vallejo
Maura Fallon-McKnight, and Kim Linse, Point
Reyes National Seashore

Last updated: 03/25/01

Pre-Visit Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Identify at least three tule elk adaptations.
- Predict one tule elk behavior prior to field visit.
- State a connection between the seasons and tule elk behaviors occurring at time of field trip.

California Science Standard Links (grades 6-8)

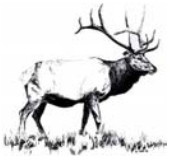
This activity is linked to the California Science Standards in the following areas:

- | | |
|-----------|--|
| 6th grade | 5a - food webs |
| | 5b - organisms and the physical environment |
| | 6a - utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process |
| 7th grade | 3a - both genetic variation and environmental factors are causes of evolution and diversity of organisms |
| | 5a - animals have levels of organization for structure and function |
| | 7b - utilize a variety of print and electronic resources |

POINT REYES NATIONAL SEASHORE

Creating
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through Science





- 7c - communicate logical connections
- 7e - communicate the steps and results from an investigation

National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Think critically and logically to make the relationships between evidence and explanations
- Content Standard C - Structure and function in living systems; Reproduction and heredity; Regulation and behavior; Populations and ecosystems; Diversity and adaptations of organisms

Materials

To be provided by the teacher:

- Resource books or computer access for students to answer questions
- Overhead projector (or chalkboard)

To be photocopied from this guide:

- **What Is A Tule Elk?** Activity Sheet (one copy per class)
- Optional: **Tule Elk Visual Aid**

Vocabulary

annual life cycle, bachelor group, bugle, harem, herbivore, molt, ruminant, rut, thrash, velvet

Procedures

1. Review

Summarize some of the key points learned about tule elk from the first lesson plan. Inform students that they will be learning about elk in more detail through their own research. Each group of students will research answers to questions and present their findings to the class.

Before beginning this lesson, gather materials that students may use to answer questions or allow access to a computer (see **Resources** section at end of guide for suggested books and Internet sites).

2. Distribute activity sheet

Form up to nine groups of students. Each group will receive a section of the **What Is a Tule Elk?** activity sheet. Remind students that each group will be responsible for presenting their findings to the class. Encourage students to create visual aids or other methods of sharing their information with the class.

If you feel the questions are too difficult (or students do not have access to resources they can use to answer the questions) supply students with questions from the master sheets (showing answers). Students can still use that information for their presentation, or use the answers provided as a guide for further research.



3. Presentations

Invite each group to the front of the class for a brief presentation of their results. Encourage other students to ask each group at least one question. An overhead projection of the **Tule Elk Visual Aid** or a student's drawing of an elk on the blackboard may assist students with their presentations.

4. Discussion

Return to Group H's second question referring to the annual life cycle of tule elk. What are the connections between what is happening in the elk's life cycle and the events associated with the seasons? Use the life cycle chart provided in *Tule Elk: The Return of a Species* Newspaper.

Why is the winter coat molted in the spring?

To get rid of it before the warmer months start; it is no longer needed.

Why do antlers start growing in the spring?

This is the season with the most food.

Why are calves born during spring?

This is the season with the most favorable weather and food.

Why are antlers shed in winter?

They are no longer needed for premating activities; they would also require a portion of the scarce energy (food) available to elk in the winter.

What activities can you expect of the tule elk during your class visit?

Answers will vary.

Extension Ideas

1. Compare/contrast life cycles of other species (plants, cows, mountain lions, badgers) as they relate to the tule elk.
2. Have students sketch the three subspecies of elk found in California, showing their comparative size to each other. Assign one group to draw a map showing the habitat range for each of these elk in the state. Discuss the different habitat preferences of each species.
3. Compare/contrast the four species of deer that live at Point Reyes National Seashore: tule elk, black-tailed deer, axis deer, and fallow deer. Discuss their different histories - one has been here "forever" (black-tailed deer), one was extirpated, relocated, and is now recovering (tule elk); the other two were introduced from overseas for hunting (axis and fallow deer). What are their similarities? How are they different? For example, black-tailed deer are not a herding species as are the elk. They have slightly different diets (black-tailed deer eat more shrubs). How might the nonnative species effect the native species in Point Reyes National Seashore (competition for habitat, food, etc.)?

What Is a Tule Elk?



Activity Master

Group A

Use the chart below to organize the information from the following questions:

1. What is the scientific name for elk(genus and species)?
2. What are the three subspecies of elk found in California today?
3. What are the relative sizes (such as length/weight) of each subspecies?

ELK (genus/ species):	<i>Cervus elaphus</i>		
Subspecies (common name):	<i>tule elk</i>	<i>rocky mountain elk</i>	<i>roosevelt elk</i>
Subspecies (latin):	<i>nannodes</i>	<i>nelsoni</i>	<i>roosevelti</i>
Total length:	80 inches	95.4 inches	92 inches
Tail length:	5.5 inches	5.6 inches	4.5 inches
Cow (lbs.):	411 pounds	445 pounds	500 pounds
Bull (lbs.):	554 pounds	730 pounds	1,054 pounds
Other:			

What is an ungulate? What other animals are related to tule elk?

An ungulate is a mammal with hooves (horses, cattle, deer, swine, and elephants). Elk are in the deer family, known as “Cervidae”. Moose, caribou, and deer are closely related to elk.

In order of size, largest to smallest:

Moose: cow = 700 pounds, bull = 1,000 pounds

Elk: cow = 410-500 pounds, bull = 500-1,000 pounds

Caribou: cow = 300 pounds, bull = up to 500 pounds

White-tailed/ black-tailed deer: 180 to 275 pounds.



What Is a Tule Elk?

Group B

How do tule elk digest their food?

Describe the four-chambered stomach.

What is the name for an animal with a four-chambered stomach?

An elk's stomach can extract nutritional value from tough plant fibers. A healthy elk will eat 15 pounds of twigs, leaves, and grasses in one day.

The elk bites and swallows food to the first chamber called the rumen. This is a "holding tank" where the food begins to break down with the help of bacteria. Then the elk regurgitates the food (cud) and ruminates (chews thoroughly) for several hours. The elk chews, swallows, and burps the cud back to be chewed again, until the particles are small enough to pass through the rumen. The second chamber is the reticulum where different bacteria digest the food further. The third chamber is the omasum, where water is squeezed out of the food and absorbed into the elk's body. The last chamber is the abomasum, where the food is broken down to the molecular level so that it can be absorbed by the intestine. This is an adaptation that helps elk get their food quickly (in open, exposed areas where they can be seen easily by predators) and find cover to chew and digest safely and out of sight of predators.

An animal with a four-chambered stomach is a ruminant.

Group C

How do researchers determine the age of an elk?

Sketch the parts of the elk's body that helps researchers determine age.

Why are they shaped the way they are?

Researchers look at the teeth to determine the age of an elk. The amount of wear on the molars and the number of adult teeth that have replaced "baby" incisors and premolars are indicative of age. If researchers can obtain a tooth, they can slice it and count the rings in a cross-section: like trees, elk teeth have annual growth rings! The flat teeth grind plant material well.

Upper tooth



Lower tooth



What Is a Tule Elk?



Activity Master

Group D

Does elk activity in an area impact other species or their shared habitat?

What other living things share the habitat with elk?

What does grazing do to plants?

What do elk hooves do to the soil and/or plants?

Their grazing and browsing stimulate growth in some plants and can reduce competition among the plants.

Deer and elk share the same habitat and some of the same food. When the habitat is healthy, many animals can share the resources and coexist well. When quality or quantity declines, competition increases. Some species and some individuals within a species will suffer as a result of this competition.

Their hooves break up soil as they move about, which creates depressions that hold water and nutrients, and provides space for seeds to germinate.

Group E

Describe the mating season behaviors of male elk. What are antlers, bugles, harems, and wallows?

Antlers help bulls fight and establish their dominance hierarchy-the antlers are fully grown by August. Bulls display these antlers and will usually decline a fight if the other bull shows larger antlers. Mature bulls will sustain injuries, but rarely die as a result of a fight.

During the rut, bulls bugle and fight. The larger bulls' bugles have a deeper pitch than the younger, smaller bulls.

Dominant bulls work to maintain their status by patrolling a harem (group of cows), chasing other bulls away, and copulating with the cows when they come into estrus.

A wallow is a muddy area where bulls roll around to cool off, spread their scent evenly over their body, and make themselves look and smell even more imposing.

How do the bull elk's behaviors change after the rut season is over?

The dominant bulls don't fight with the other bulls, they don't bugle, and they hang out with other bulls. The behavior of the bachelor bulls doesn't change significantly. The prime bulls leave the harems and join bachelor groups or stay solitary.





What Is a Tule Elk?

Group F

Explain the purpose of three different sounds made by elk (squeal, bark, high-pitched squeal, bugle).

Vocalizations are rare, usually only heard during the rut or when the elk are in danger.

Squeal/Mew/Chirp: general conversation in a harem.

Bark: warning of danger, usually between cows or mother and calf.

High-pitched squeal: newborn to its mother, bonding and recognition, when faced with danger.

Bugle: bull warning other bulls to stay away, announcing his readiness to fight, or advertising to potential cows that he's the one they want to breed with. It's a bellow that escalates to a squealing whistle and ends with a grunt.

Explain the purpose of three different nonverbal communication techniques or behaviors used by elk. To the best of your ability, demonstrate each behavior! (example: locking antlers, boxing...)

Grimace: A bull sticks his head forward and upward while curling back his upper lip. He is "testing" the air to see if a female is in estrus (ready to breed).

Thrashing: A bull uses his antlers to thrash the ground or vegetation.

Charge: A male lunging at another either as a threat or in the beginning of a battle.

Locking Antlers: During a serious battle, two bulls will lock antlers and try to throw one another off balance.

Boxing: Two cows rear up on their back legs and clash their hooves. This display is believed to be a sign of aggression. Antlerless males also box.

Predator Avoidance: For the first few weeks of life, a newborn calf is protected by remaining close to its mother, separate from the herd, and lying still in surrounding vegetation. Calves have little scent so as not to attract predators, and the white spots on the calf's coat help to camouflage it.

Bedding Down: Lying down to rest, sleep, or ruminate.

What Is a Tule Elk?



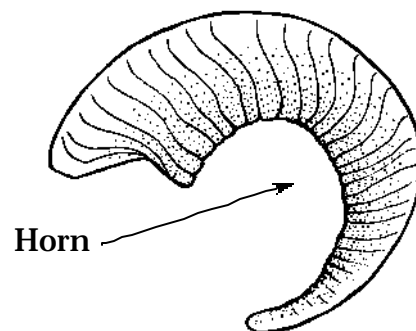
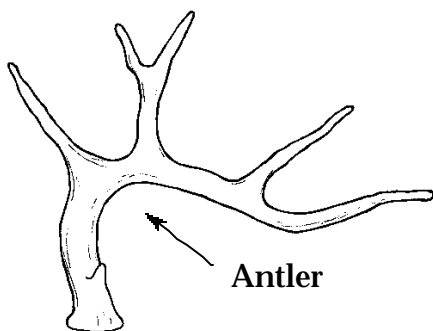
Activity Master

Group G

What is the difference between antlers and horns?
Sketch an example of each.

Antlers are made of bone (the fastest growing bone of any mammal) and are shed and regrown every year. They are grown only by males (except in caribou). Antlers usually have branches or spikes.

Horns are usually grown by males and females. They are made of keratin (same material as your fingernails) that grows slowly around a small core of bone. Horns are permanent; they are not shed. Horns usually grow in "rings" that mark the animal's age.



Describe antler development. How are they grown and shed every year? Do antlers play a role in the ecosystem after they are shed?

Growth: Increasing amounts of daylight (March/April) trigger more testosterone to be produced in the elk's blood. This stimulates layers of cartilage to grow which mineralize into bone. Antlers can grow as fast as an inch a day in the summer months! Velvet protects and carries blood to the growing bone tissue. The blood stops flowing to the antlers in July/August when the antlers become hard and the velvet peels, or is rubbed off. Grooves on the antlers show the locations where veins carried blood to the growing antlers.

Shedding: In October, after the rut, testosterone levels gradually decline until it is hardly being produced at all. Eventually, the antlers simply fall off, or are shed, one at a time. Some bleeding may occur, but it heals quickly. The older bulls shed first, in late February or March, while some yearling bulls retain their antlers until May.

Antlers play an important role in the ecosystem after they are shed. They are gnawed on by rodents and deer, slowly broken down, and they ultimately decompose. Calcium is difficult to find in nature, and antlers provide an important calcium supplement.



What Is a Tule Elk?

Group H

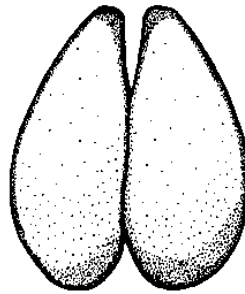
How do tule elk coats change from winter to summer? Why do they change?

The coat is much heavier in the winter to keep the elk insulated. As summer approaches, the elk will molt so that it does not overheat during long, hot summer days. In the summer heat, the light-colored coats reflect the hot sun. In the winter, the hair grows long and becomes dull in color.

Using **The Annual Life Cycle of Tule Elk** found in the *Tule Elk: The Return of a Species* newspaper, determine what you expect to see in the month your class will be visiting the Seashore.

Answers will vary

Draw an elk track.



An elk track looks like a large deer track. It's a mirror image, two-sided print, tapered toward the front and round at the top

Why do elk have white rumps?

It's believed to be a form of warning coloration and a way for other elk to find the herd.

What Is a Tule Elk?



Activity Master

Group 1

How old is a female tule elk when she can give birth to her first calf? What is the gestation period for tule elk? How many months does the calf nurse?

A female tule elk is sexually mature by two years of age. The gestation period for tule elk is 8.5 months and the young are born from mid-May through early July. A calf will nurse for four or five months or longer (yearlings have been observed nursing).

What are scent glands? Where are they and what do they do?

Scent glands are any of various specialized skin glands, occurring in many kinds of animals, that emit an odor commonly functioning as a social or sexual signal or a defensive weapon. Scent glands are located: on the external part of the hind leg, just below the hock (lower joint, corresponding anatomically to the ankle in humans); on the belly, near the penis (also called the belly patch); around the vagina and anus in females; in the hollow cavity anterior to the eye; around the hair follicles at the velvet of growing antler; on the ventral (toward the belly) side of the tail.

How are elk eyes and ears adapted to help them live?

The eyes are located on the sides of their heads, enabling them to see predators for almost 360 degrees. The ear shape and large size help to capture and channel sound.



What Is a Tule Elk?

Activity Sheet

Group A

Use the chart below to organize the information from the following questions:

1. What is the scientific name for elk (genus and species)?
2. What are the three subspecies of elk found in California today?
3. What are the relative sizes (such as length/weight) of each subspecies?

ELK (genus/ species):			
Subspecies:			
Total length:			
Tail length:			
Cow (lbs.):			
Bull (lbs.): or sketch:			
Other:			

What is an ungulate? What other animals are related to tule elk?

Group B

How do tule elk digest their food?

Describe the four-chambered stomach.

What is the name for an animal with a four-chambered stomach?



Name _____ **Date** _____

What Is a Tule Elk?

Activity Sheet

Group C

How do researchers determine the age of an elk?

Sketch the parts of the elk's body that help researchers determine age.
Why are they shaped the way they are?

Group D

Does elk activity in an area impact other species or their shared habitat?
What other living things share the habitat with elk?
What does grazing do to plants?
What do elk hooves do to the soil and/or plants?

Group E

Describe the mating season behaviors of male elk. What are antlers, bugles, harems, and wallows?

How do the bull elk's behaviors change after the rut season is over?

Group F

Explain the purpose of three different sounds made by elk (squeal, bark, high-pitched squeal, bugle).

Explain the purpose of three different non-verbal communication techniques or behaviors used by elk. To the best of your ability, demonstrate each behavior! (example: locking antlers, boxing...)



What Is a Tule Elk?

Group G

What is the difference between antlers and horns?

Sketch an example of each.

Describe antler development. How are they grown and shed every year? Do antlers play a role in the ecosystem after they are shed?

Group H

How do tule elk coats change from winter to summer? Why do they change?

Using **The Annual Life Cycle of Tule Elk** found in the *Tule Elk: The Return of a Species* newspaper, determine what you expect to see in the month your class will be visiting the Seashore.

Draw an elk track.

Why do elk have white rumps?

Group I

How old is a female tule elk when she can give birth to her first calf? What is the gestation period for tule elk? How many months does the calf nurse?

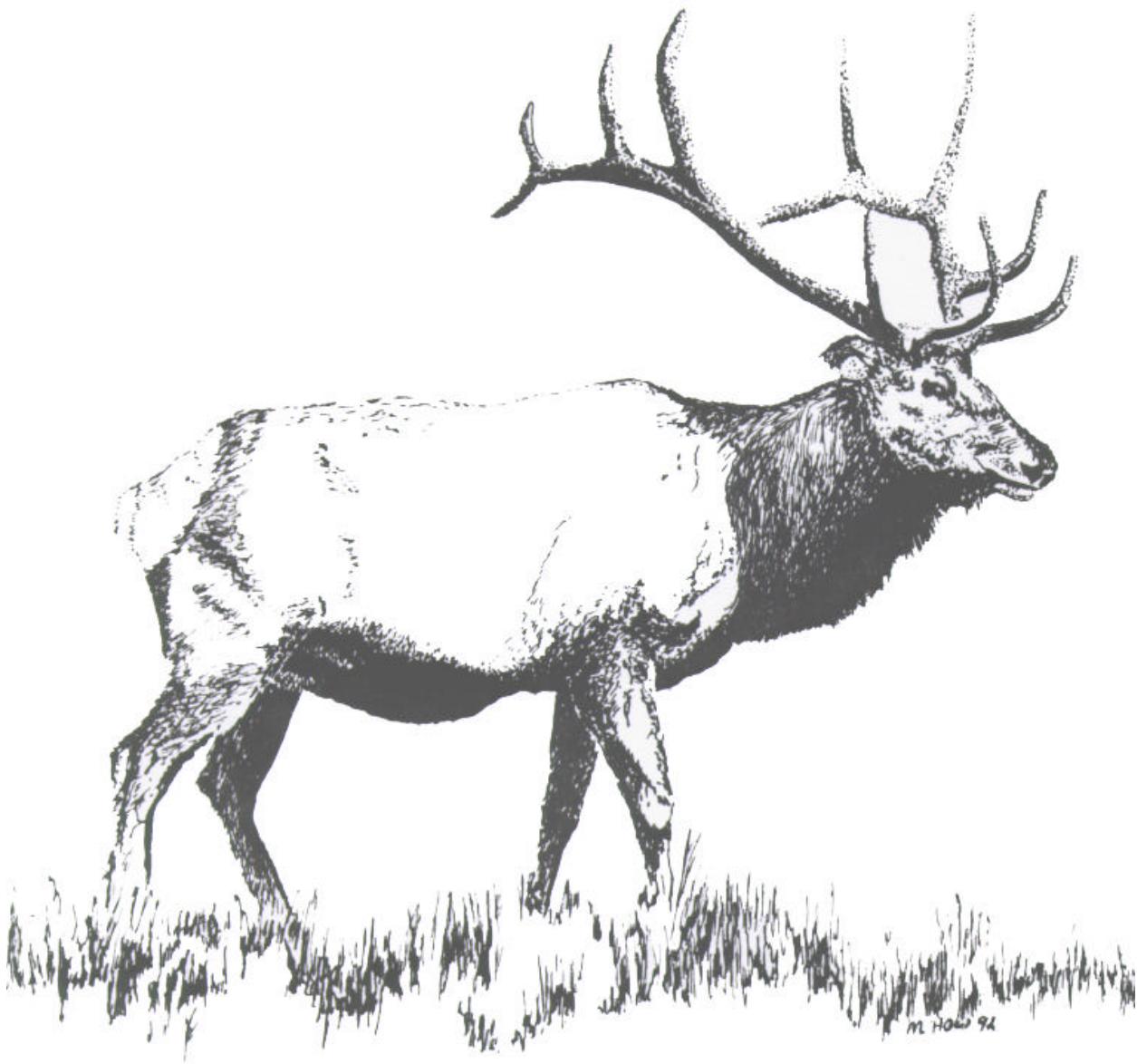
What are scent glands? Where are they and what do they do?

How are elk eyes and ears adapted to help them live?

Tule Elk Visual Aid



Teacher Information



How Is Tule Elk Research Done?



Students will explore techniques that are used by scientist at Point Reyes National Seashore to monitor tule elk herds. Students will also imitate one method used to locate an elk due for an immunocontraceptive booster shot. This is an in-class activity illustrating one research tool. If students are aware of these research methods prior to their upcoming field visit to Point Reyes National Seashore, their onsite observations will be more focused and meaningful.

Time required: 1 hour

Location: classroom

Suggested group size: entire class

Subject: science research

Concept covered: wildlife management

Written by: Josh Risley, Tomales School, Kim Linse and
Lynne Dominy, National Park Service

Last updated: 03/25/01

Pre-
Visit

Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Understand how researchers raise and answer questions
- Explain different types of research tools used to study wildlife

California Science Standard Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

- 6th grade
- 5b - organisms and the physical environment
 - 5e - numbers and types of organisms an ecosystem can support depends on the resources available
 - 7c - develop qualitative statements about the relationships between variables
 - 7d - communicate the steps and results from an investigation
 - 7f - interpret a simple scale map

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7th grade

7a - appropriate tools and technology to perform tests, collect and display data

7c - communicate logical connections

8th grade

9c-distinguish between variable and controlled parameters in a test

National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Identify questions that can be answered through scientific investigations; use appropriate tools and techniques to gather, analyze, and interpret data; Think critically and logically to make the relationships between evidence and explanations
- Content Standard C - Reproduction and heredity; Regulation and behavior; Populations and ecosystems
- Content Standard F - Populations, resources, and environments
- Content Standard G - Science as human endeavor; Science and technology in society

Materials

To be provided by the teacher:

- rulers, one per student

To be photocopied from this guide:

- **Research Questions and Tools** Activity Sheet
- **Tomales Point Elk Location Grid** Activity Sheet

Vocabulary

immunocontraception, radio collar, radio telemetry, wildlife management

Procedures

1. Introduction

Introduce wildlife management and research management tools to students. Explain that wildlife management is the application of scientific knowledge and technical skills to protect, preserve, conserve, or enhance the value of wildlife and its habitat. Examples of management tools include examples mapping, photography, observation, and population counts.

2. Research Questions and Tools activity sheet

Provide each student with the **Research Questions and Tools** activity sheet. In the column on the left, students should list all of the questions that tule elk researchers might have. When they are finished with the column on the left, each question or group of questions should have a corresponding, appropriate tool listed on the right. Students may complete this worksheet individually or as an entire class, using the blackboard to record their ideas. Use the activity master to review their work or initiate brainstorming.



3. Tomales Point Elk Location Grid activity sheet

Each student will have an opportunity to mimic a method used to locate individual elk in the field. Provide each student with the **Tomales Point Elk Location Grid** activity sheet and a ruler. Set the scene with the following information:

You are a wildlife biologist, administering immunocontraceptive booster shots to the female tule elk at Point Reyes National Seashore. It's a foggy day and you're working with a partner, trying to locate one specific elk. Each elk that needs to receive a booster shot is wearing a radio collar. Each collar emits a radio frequency beep pattern, or signal. You're carrying a radio telemetry receiver, equipped with a radio antenna and headset so you can listen to the beeps emitted from the radio collars. You have a list of the cows and their assigned signals or collars. To find "your" elk, you and your partner hike to different locations (Water Tank and Upper Pierce Ranch) and point your radio antennae around until you hear the specific signal given off by the cow's radio collar. From your different locations, you take compass readings and record the direction from which the signal is coming. To find the exact location of the elk, you use these two directions from each of your locations. Where the directions intersect is the exact location of the elk you're looking for.

Instruct students to locate Upper Pierce Ranch and the Water Tank on their maps. Students should draw a line directly north from Upper Pierce Ranch and directly southeast from the Water Tank. Where the two lines intersect is the location of the elk. Now, as researchers, the students would need to hike to that location to administer the elk's immunocontraceptive booster shot.

4. Discussion

How does information gained in research effect the way the area and organisms are managed? For example: what actions would be taken if it was found that the population was too low or too high?

5. For 8th grade students

Form small student groups and assign each group a separate research question from the **Research Questions and Tools** activity sheet. Instruct each group to design a research project revolving around that question which distinguishes between variable and controlled parameters in a test.

Research Questions and Tools



Activity Master

In the column on the left, list as many questions as you can think of that tule elk researchers might have. In the column on the right, brainstorm research tools that could be used to find answers to these questions.

Questions	Research Tools
<i>What is the size of each elk's home range?</i>	<i>radio collar tracking and mapping</i>
<i>What habitats do they prefer?</i>	<i>radio collar tracking and mapping, observations</i>
<i>Are the elk alive? Have any elk died?</i>	<i>radio collar tracking with mortality mode motion sensors, observations</i>
<i>What has caused an elk to die?</i>	<i>blood samples, necropsy</i>
<i>How many elk live at Point Reyes?</i>	<i>observations, population counts, pellet counts</i>
<i>How many calves are born each year? What is the population growth rate?</i>	<i>population counts, radio-collaring and monitoring of cows</i>
<i>Are diseases affecting the survival of the elk?</i>	<i>fecal collection, blood samples, necropsy</i>
<i>What impact are the elk having on the habitat?</i>	<i>elk exclosures, photography, plant transects, water quality measurements, aerial photography of elk trails, small mammal trapping for population estimates</i>
<i>What do the elk eat?</i>	<i>fecal collection, observations, necropsy, exclosures</i>
<i>What behaviors are most common? How do they vary throughout the year?</i>	<i>observations, remote cameras (possibly in the future)</i>



Research Questions and Tools

In the column on the left, list as many questions as you can think of that tule elk researchers might have. In the column on the right, brainstorm research tools that could be used to find answers to these questions.

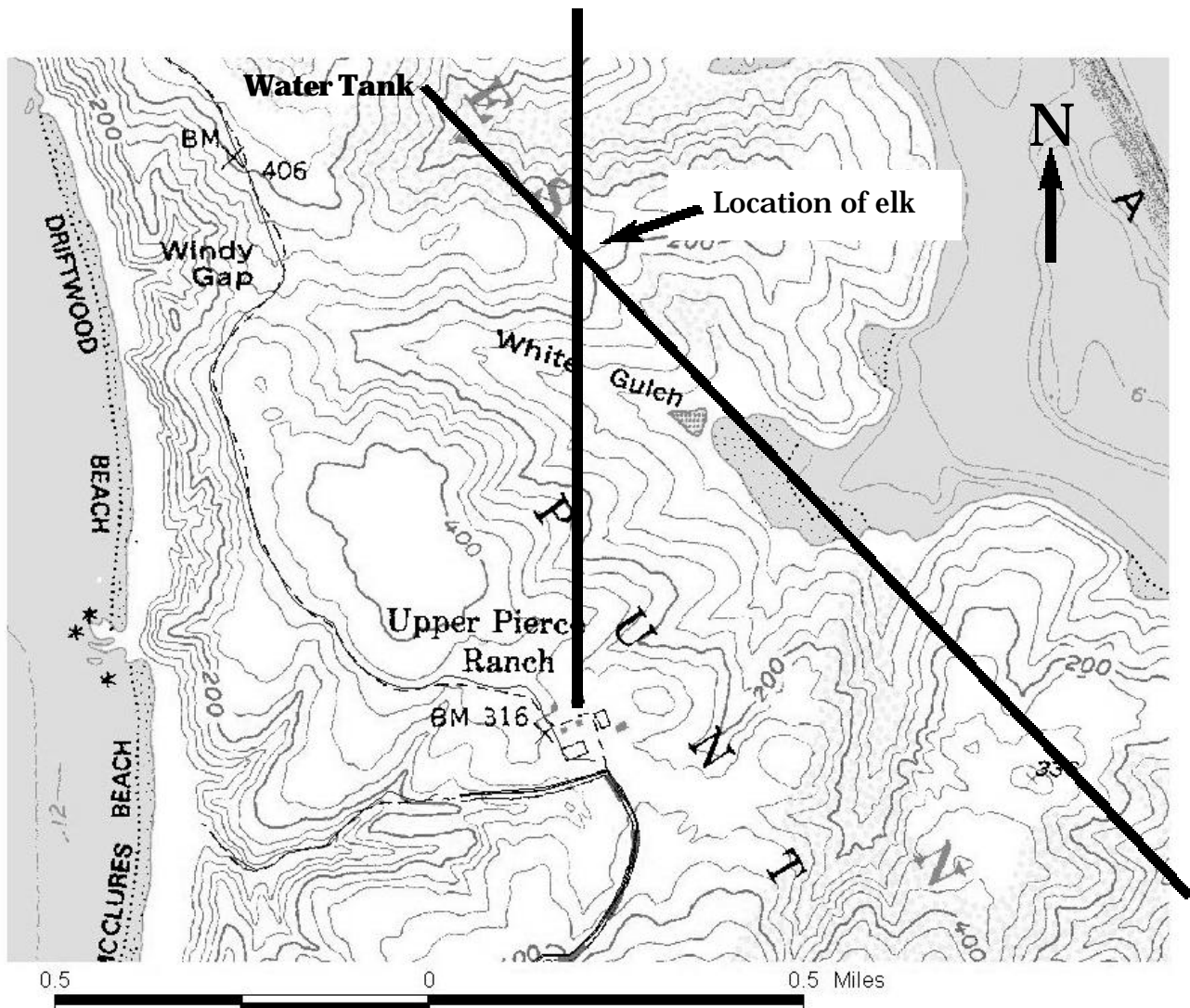
Questions	Research Tools

Tomales Point Elk Location Grid



Activity Master

You are a wildlife biologist, administering immunocontraceptive booster shots to the female tule elk at Point Reyes National Seashore. It's a foggy day and you're working with a partner, trying to locate one specific elk. Each elk that needs to receive a booster shot is wearing a radio collar. Each collar emits a radio frequency "beep" pattern, or signal. You're carrying a radio telemetry receiver, equipped with a radio antenna and headset so you can listen to the beeps emitted from the radio collars. You have a list of the cows and their assigned signals or collars. To find "your" elk, you and your partner hike to different locations (Water Tank and Upper Pierce Ranch) and point your radio antennae around until you hear the specific signal given off by the cow's radio collar. From your different locations, you take compass readings and record the direction from which the signal is coming. To find the exact location of the elk, you use these two directions from each of your locations. Where the directions intersect is the exact location of the elk you're looking for. The signal from the Water Tank came from the southeast and the signal from Upper Pierce Ranch came from directly north. Use this information to locate your elk.



POINT REYES NATIONAL SEASHORE

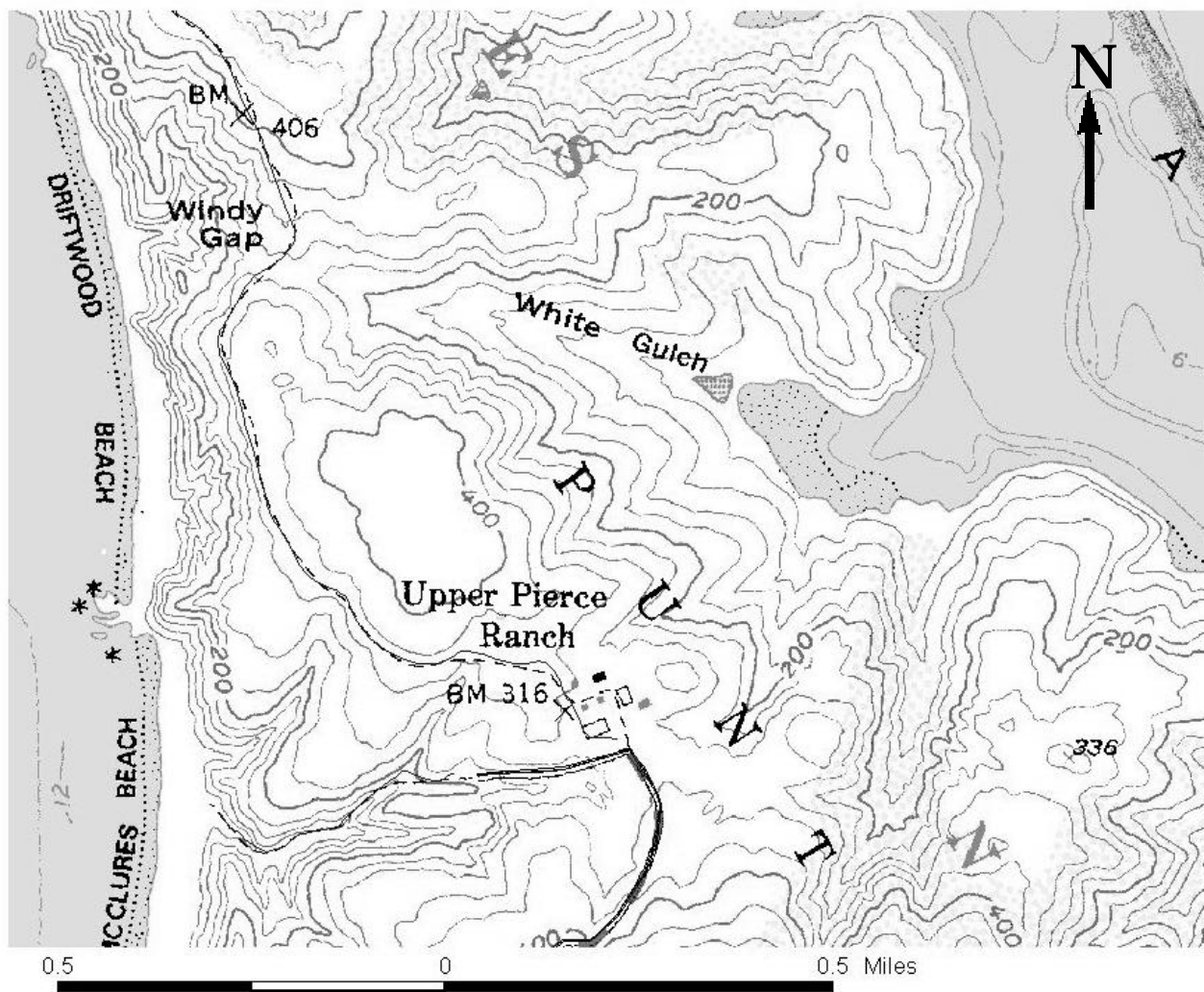




Tomales Point Elk Location Grid

You are a wildlife biologist, administering immunocontraceptive booster shots to the female tule elk at Point Reyes National Seashore. It's a foggy day and you're working with a partner, trying to locate one specific elk. Each elk that needs to receive a booster shot is wearing a radio collar. Each collar emits a radio frequency beep pattern, or signal. You're carrying a radio telemetry receiver, equipped with a radio antennae and headset so you can listen to the beeps emitted from the radio collars. You have a list of the cows and their assigned signals or collars. To find "your" elk, you and your partner hike to different locations (Water Tank and Upper Pierce Ranch) and point your radio antennae around until you hear the specific signal given off by the cow's radio collar. From your different locations, you take compass readings and record the direction from which the signal is coming. To find the exact location of the elk, you use these two directions from each of your locations. Where the directions intersect is the exact location of the elk you're looking for. The signal from the Water Tank came from the southeast and the signal from Upper Pierce Ranch came from directly north. Use this information to locate your elk.

Activity Sheet



Radio Collaring Tule Elk



Teacher Information

Individual elk that are involved in scientific research are fitted with radio collars. Each collar is uniquely color-coded, and each collar has a transmitter and battery in a metal box that hangs under the animal's neck. The transmitter sends a unique signal every other day which biologists listen to with radio receivers. They transmit their signal for up to five years. These signals can only be heard with specialized equipment-they cannot be heard with the human ear.

The collars also have unique color codes. If you see a collar with an orange stripe, the elk wearing that collar is part of the immunocontraceptive study.

Only cows are collared at Tomales Point, and in 2000, a total of 90 animals had collars. At Limantour, 16 cows are collared.

How are the elk fitted with their radio collars? Each elk was captured individually to place the collars. First a net was thrown over the elk from a helicopter, then it was hobbled (four legs tied together) and blindfolded (this helps calm the elk). Then the scientist secured the collar around the elk's neck. Some collars are made to break away after a few years, while others will remain for life.

In order to learn where the elk go and how they utilize their habitat throughout the seasons, biologists follow the elk and record their locations.

What Can We Expect on Our Field Trip to the Tule Elk Reserve?



Pre-Visit

Lesson Plan

Students will prepare for upcoming field visit by constructing journals and reviewing personal field trip expectations. It is very important that students are familiar with these journals prior to their visit. This will allow students to maximize their time viewing elk, rather than receiving instruction.

Time required: 1 hour

Location: classroom

Group size: all

Subject: science

Concept covered: preparation for scientific survey

Written by: Christie Denzel Anastasia and Lynne Dominy,
National Park Service

Adapted by: Kim Linse and Melinda Repko, National Park
Service

Last updated: 06/01/01

Student Outcomes

At the end of this activity, the students will be able to:

- Effectively utilize field journals while viewing tule elk.

California Science Standards Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

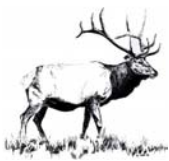
6th grade 7b - appropriate tools and technology to perform tests, collect data, and display data

7th grade 7a - appropriate tools and technology to perform tests, collect data, and display data

7c - communicate logical connections

8th grade 9a - plan and conduct a scientific investigation to test a hypothesis





National Science Standard Links (Grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Use appropriate tools and techniques to gather, analyze, and interpret data; understanding about scientific inquiry
- Content Standard G - Science as a human endeavor; Nature of science: students formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models

Materials

To be photocopied from this guide:

- **Field Journals** for each student (located with **How Do Researchers Survey Tule Elk?** on-site lesson)
- **Field Journals** for each chaperone so they can assist students while on the field trip
- Optional: activity sheet from **How Can I Capture My Experience in a Story, Poem, or Drawing?** on-site lesson, based on teacher/student interests

Available for reservation at Bear Valley Visitor Center:

- Tule Elk Field Trip Kit: 20 pairs of binoculars, spotting scope, etc.

Procedures

1. Logistics to Consider Before Field Trip

Make reservations for Tule Elk field trip and kit reservation by using the Reservation form provided in the Teacher Preparation section of this guide.

There are three areas within the Tule Elk Reserve where elk are likely to be located: Tomales Point Trail to White Gulch, parking lot to McClures Beach, and along the road above the parking lot. All of these are marked on the map included in the "Attachment" section of Teacher's Preparation.

Prepare to be flexible about locations where you might observe tule elk. Elk are free to roam within the 2,600 acre reserve.

2. Construct Field Journals

Distribute photocopies of Field Journal sheets for students to assemble. Refer to **Tips for Constructing Field Journals** following this lesson.

3. Review Field Activities

Once journals are completed, review field activities by having students turn to the appropriate pages in their journals as you review expectations listed below. Students may also record their names at the bottom of each journal sheet (in the event that sheets become separated from the journal).



- Things to Remember While on Field Trip

This sheet will be used in the next lesson Safety and Stewardship Challenge.

- Habitat Survey at Trailhead

Students will fill in the appropriate information based on their observations. The air temperature and wind speed can be estimated, or students can use the thermometer and anemometer available in the Tule Elk Kit. Students can describe the location in terms of what they see, smell, hear, etc.

- Elk Population Survey

Once students find a group of elk to survey, students will record the numbers of each type of elk they see (bulls, cows, calves). Students will also record information on radio collars and "signs" of elk such as scat or footprints.

Review with students the difference between male, female, and calf elk. For the purposes of this activity, students should assume any elk without antlers are females (most classes will visit during the season that males have antlers).

- Field Guide to Elk Behaviors

Students will use this sheet to list the types of behaviors they are observing on the following sheet titled "Elk Behavior Survey."

- Elk Behavior Survey

Students will record the behaviors they observe and indicate whether it was a bull, cow, or calf performing the behavior.

- Mapping

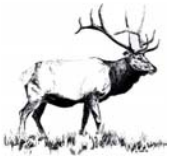
Students will map the elk they observe in a "bird's-eye" view. Students may choose to use the line drawn map or the topographical map. The Topographical Map is more accurate, but the Line Drawn Map may be more appropriate for younger students. The blank map is used for any area other than White Gulch where students may want to map a tule elk herd.

- Habitat Survey on Tomales Point Trail

Students will have a chance to sit down somewhere near the Tomales Point Trail to answer the questions on this sheet.

- Exclosure

If the class walks by an exclosure close to the trail, this sheet can be used to focus their observations. An exclosure will look like a high wooden fence forming a square over a section of land.



- Human Influences on Tomales Point

Students will have a chance to sit down somewhere near the Tomales Point Trail or trailhead to answer the questions on this sheet.

4. Field Trip Preparation

Review what students should bring on their field trip.

Extension Ideas

1. Practice identifying elk behaviors in class. Show students the images of elk behaviors (in the journal) without the descriptions and have them guess which behavior is being depicted. This is excellent practice for the **Elk Behavior Survey** field journal sheet.
2. Practice the Mapping activity in class. Have half of the students spread out in an open area and have the other half of the class "map" the surrounding area and where individuals are located. This is excellent practice for the **Mapping** field journal sheet. Remember to have students identify males, females, and behaviors.
3. Research the laws written to protect mammals, plants, and amphibians in Point Reyes National Seashore, California, and the United States. What happens if a protected animal leaves the area affording protection?
4. Research the role of a wildlife biologist and other types of careers in wildlife management. What is done with information collected in the field, and how does it help the organism being studied?

Tips for Creating Field Journals



Journal Tips

Materials

- ☐ Field Journal sheets for each student, teacher, and chaperone
- ☐ One package blank paper and one package lined paper
- ☐ Colored paper, cardstock, or cardboard for journal covers
- ☐ Magic markers or colored pencils for decorating covers
- ☐ 3-hole punch
- ☐ String, binding tape, or twigs and rubber bands for binding
- ☐ Pencil on a string for each student
- ☐ Two plastic pencil sharpeners and extra pencils for field trip
- ☐ One box of large ziplock bags to rainproof journals

Procedures

1. Photocopy all of the unit handouts and provide each student with double-sided copies. Use recycled paper if it is available.
2. Provide five additional blank sheets of paper and five lined sheets of paper to each student.
3. Have students create front and back covers for their journals using blank sheets of paper.
4. Have students bind their journals using binding tape, hole punches and string, cardboard, or a twig bound by rubber bands threaded through holes.
5. Once journals are bound, have students decorate the covers.
6. Have each student attach a sharpened pencil on a long string through a hole in the journal binding.
7. Have each student use a magic marker to write their name on the front cover of their journal.
8. Students will need a sturdy writing surface behind their field journals. Incorporate cardboard as the last page or have clipboards available for each student.

Extension Ideas

1. Create a journal that is used throughout the year.
2. Share student journals with parents at open houses.
3. Students may choose to use their journals to create a class newsletter, resource newspaper, or class website.



Safety and Stewardship Challenge



Students will learn methods for observing tule elk and understand proper behaviors in a National Park. This will be accomplished by simulating a group "game show" and completing the first page of their field journals.

Time required: 1 hour

Location: classroom

Suggested group size: any

Subject: science

Concepts covered: low impact use of natural areas, behaviors in a National Park, safety

Written by: Christie Denzel Anastasia and Lynne Dominy,
National Park Service

Last updated: 06/20/00

Pre-Visit Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- List three safety precautions for upcoming field trip.
- List three proper behaviors for viewing tule elk.
- Understand concepts of National Park System and stewardship.

National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard F - Personal Health: Injury Prevention; Populations, resources, and environment.

Materials

To be provided by the teacher:

- Desk bell (or other device to indicate which team has the first answer)

To be photocopied from this guide:

- **Safety and Stewardship Challenge Questions** Teacher Information Sheet (one set)



Vocabulary
stewardship





Procedures

1. Divide class into teams.

Option A: If your class works well in large groups, divide the class into two teams. Each team will need a spokesperson and team name. Answers will come from the entire group. Spokesperson can change throughout the game.

Option B: If your class may get too loud, students can still be divided into teams, but answers will come from individuals on each team. One person from each team will be assigned a number. Team A and Team B will each have a #1, #2, etc. Randomly choose a number from a hat. The student with that specific number from each team will be responsible for answering the question. Random choice of numbers will help students pay attention if they aren't quite sure when their turn will occur.

2. Draw Challenge Grid and Scorecard on Blackboard.

There are four categories with questions of varying value. As a finale, there is a final challenge question. Draw this grid on the chalkboard:

Safety and Stewardship Challenge			
Category #1 Take Care of Yourself	Category #2 Minimize Your Impact	Category #3 Tule Elk Etiquette	Category #4 The National Park Service
1 point	1 point	1 point	1 point
2 points	2 points	2 points	2 points
3 points		3 points	
4 points	3 points	4 points	3 points
		5 points	
Final Challenge			

3. Choose Game Show Hosts

Option A: Teacher is responsible for asking all of the questions.

Option B: Four students will become "Challenge Hosts." Each student receives questions for a specific category and will ask appropriate questions according to point value.



4. Rules of the Game

- A coin flip will determine which team goes first.
- The game will end when a predetermined time runs out or when all questions have been answered.
- Team will decide which category and value of question will be asked.
- Spokespersons or individuals will poise themselves on either side of the desk bell with one hand behind their back.
- After the question is asked, the first team ready to answer will ring the bell and respond. If they are correct, the team receives the full point value.
- If they are incorrect, the other team gets a chance. If they also get it wrong, the first team can try again for one less point.
- When brainstorming answers, students should whisper so the other team doesn't eavesdrop.
- When all of the categories are complete (or 5 minutes before a predetermined "game-over" time), class will go into "Final Challenge." Each team decides on the amount of their wager, listens to the question, and writes down their answer on a sheet of paper. Each team reveals their answer.
- At the end of the game, the team with the most points "wins," but everyone wins if your visit to Point Reyes National Seashore is safe for you and the resources.

5. Complete first page of field journal.

Using the information gained in this game show, have students list at least three items under each category on the first page of their journal (**Things to Remember While on Field Trip**). Use the **Safety Issues: Tule Elk** Teacher Information Sheet at the end of this lesson as a guide.

Safety and Stewardship Challenge Questions



Teacher Information

CATEGORY #1: Take Care of Yourself

1 point

Bring a water bottle and drink plenty of water because...

- A you will not be able to speak well with a dry throat.
- B not drinking enough water can give you a headache and cause you to make bad decisions.**
- C a heavy water bottle will slow you down as you are walking.
- D All of the above

2 points

If the sun feels warm, you should...

- A try to get a tan.
- B use sunglasses, sunscreen, and/or a hat.**
- C take off your shoes and walk barefoot.
- D All of the above

3 points

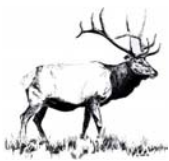
Cliff edges at Point Reyes National Seashore are...

- A made of granite and safe as long as you have one foot flat on the ground at all times.
- B sandy, loose, and slippery, be careful at all times.**
- C safe if you have good balance.
- D the best places for a good view.

4 points

The best way to dress for a field trip:

- A comfortable, close-toed shoes.
- B a t-shirt and a heavy, waterproof jacket.
- C "like an onion," -many thin layers with a waterproof one on the outside.
- D A and C**



Safety and Stewardship Challenge Questions

CATEGORY #2: Minimize Your Impact

1 point

When visiting Point Reyes National Seashore, you should stay on trails because...

- A you are more likely to pick up a tick in grassy areas.
- B when you travel off-trail you can damage plants.
- C you are causing erosion.
- D all of the above**

2 points

It's okay to take home just one rock from Point Reyes National Seashore.

- A Sure, it's just one, but let your teacher know.
- B No, every rock is home to many bugs and plants.
- C No, with 2.5 million visitors, the Seashore would be rock-less if every visitor collected just one.
- D B and C**

3 points

Trash is....

- A okay to hide behind bushes in a National Park because it will eventually break down.
- B not a good source of food for hungry animals.
- C not a part of the Point Reyes National Seashore ecosystem and should be properly disposed of whether it's yours, or trash that someone else accidentally left behind.**
- D only the responsibility of the maintenance staff, wherever it is.

Safety and Stewardship Challenge Questions



Teacher Information

CATEGORY #3: Tule Elk Etiquette

1 point

If a tule elk is close, you should...

- A feed it some of your lunch.
- B leave it alone; if the elk becomes alert or nervous you are too close.**
- C make alpha bull noises so it will look your way.
- D yell really loud to your entire group so everyone sees it, even if it may scare the elk away.

2 points

The best way to observe tule elk is to:

- A watch quietly.
- B whisper.
- C move slowly.
- D all of the above**

3 points

Tule elk were nearly driven to extinction because of:

- A hunting.
- B conversion of tule elk habitat into agricultural land.
- C disease.
- D all of the above
- E A & B**

4 points

When is it appropriate to approach a tule elk?

- A When there are a cow and a calf ONLY.
- B When there are a bull and a group of cows.
- C When two bulls are challenging each other.
- D You should NEVER approach a tule elk.**

5 points

If you see a tule elk antler, you should...

- A take it home as a souvenir.
- B return it to the closest elk missing an antler.
- C leave the antler just where you found it. Rodents and other wild species will chew it and use it as a source of calcium.**
- D report the antler to a ranger immediately-a loss of antlers is a sign that the tule elk are sick.



Safety and Stewardship Challenge Questions

CATEGORY #4: The National Park Service

1 point

Which of the following is not in the National Park Service?

- A Grand Canyon National Park, AZ
- B Keweenaw National Historical Park, MI
- C Monterey Bay Aquarium, CA**
- D Golden Gate National Recreation Area, CA
- E Yosemite National Park, CA

2 points

I should treat Point Reyes National Seashore with respect because...

- A ...it belongs to everyone in the entire United States.
- B ...it preserves a part of the ecosystem you live in and depend on.
- C ...it's one of the few places natural processes can happen with little intervention from human beings.
- D All of the above**

3 points

Which of the following is the mission of the National Park Service?

- A. Preserve natural and cultural resources.
- B. Provide for the enjoyment, education, and inspiration of this generation.
- C. To care for special places saved by the American people so that all may experience our heritage.
- D. Cooperate with other resource-conservation and outdoor-recreation organizations in our country and the world.
- E. All of the above**

Bonus for one additional point:

Is the Mission of the National Park Service a law? **Yes/No**

Yes. The 1916 Organic Act mandates the National Park Service to preserve and protect the natural and cultural heritage of the United States for the enjoyment of its citizens, leaving them unimpaired for the enjoyment of future generations.

FINAL CHALLENGE

This question is worth the amount that each team agrees to wager.

What does Stewardship mean?

Teacher is the final judge on this answer.

Safety Issues: Tule Elk



Teacher Information

Personal Safety

- Watch where you are walking; the ground may be rocky and uneven.
- Stay with your group.
- Drink plenty of water to avoid dehydration.
- Protect yourself from the sun's rays; use sunscreen and/or a hat.
- Stay on paths and in picnic area. Grassy areas may have ticks known to transmit Lyme Disease.
- Be aware of students' and chaperones' allergies and conditions that may cause concern on the trail.
- Bring warm clothes with you on the trail at Tomales Point. The weather may be warm at the beginning of a hike and then quickly turn cold and windy or vice-versa.

Elk Watching Tips

- Always observe elk from a safe distance. Use binoculars and spotting scopes to get a good view.
- Speak in whispers.
- Never come between two elk!
- Stay far away from bulls during rutting season.
- If you are near elk and they appear nervous or begin to move away, you may be too close. Slowly back up.

Remember... You are in a part of the National Park System

- Point Reyes National Seashore is a natural area set aside by Congress and concerned citizens to protect living and nonliving components of an ecosystem. Treat everything with respect.
- Allow plants, rocks and everything to continue their existence as part of an ecosystem by leaving all things as they are found.
- Stay on established trails and pack out trash or use garbage cans.

How Do I Use Binoculars?



Students prepare for upcoming tule elk field trip by becoming familiar with binocular structure and use. The ability to use binoculars will be crucial for observing tule elk behaviors and other details.

Time required: varies

Location: in class and/or sections at Bear Valley Visitor Center

Suggested group size: entire class

Subject: physics

Concepts covered: binocular structure and use

Written by: Christie Denzel Anastasia, National Park Service

Last updated: 09/31/00

Pre-Visit Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Understand the structure of binoculars.
- Practice focusing on moving images with binoculars.

California Science Standard Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

- 6th grade 7b-appropriate tools/technology to perform tests, collect/display data
- 7th grade 6b-to see an object, light emitted/scattered must enter eyes
6d-simple lenses used in optics
7a-appropriate tools/technology to perform tests, collect/display data

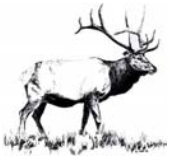
National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Abilities necessary to do scientific inquiry: use appropriate tools and techniques to gather, analyze, and interpret data.

Creating
COASTAL STEWARDSHIP
through Science





Materials

To be provided by the teacher:

- Tule Elk Kit and 20-40 pairs of binoculars (available for checkout at the Bear Valley Visitor Center)

Procedures

Note: This lesson can be done in various stages depending on whether or not students have access to binoculars in class.

If students can **bring in a pair** of binoculars to use in class--
this entire lesson can be conducted in class.

If students can **share a pair** of binoculars to use in class--
Procedures 1 and 2 can be taught to the entire class. Student teams can experiment with binoculars in 10-minute intervals throughout the day.

If students **do not have access** to binoculars--
Procedures 1 and 2 can be conducted in class, and Procedure 3 at Bear Valley Visitor Center when students receive individual binoculars from the Tule Elk Kit..

1. How do binoculars work?

In Theory: Before prisms were available, lens barrels had to be very long to increase the distance between the eyepiece lens and the objective lens to achieve magnification. These are the traditional "pirate scopes." With the introduction of prisms, the light could be bent and barrels were made shorter. Binocular vision allows two images to become one for depth perception. Monoculars are like binoculars, but made for one eye and provide no depth perception.

In Structure: There are four main components of binoculars. Power is a function of these components. A 6x30 binocular has 6x magnification and a 30-millimeter lens. A larger lens lets in more light.

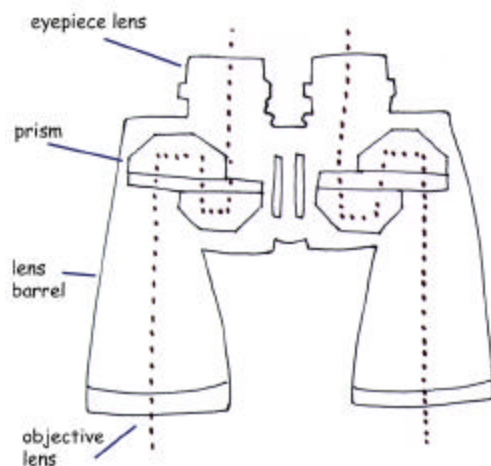
Eyepiece Lens: There are several convex lenses here for magnification. These are the lenses closest to your eyes.

Prism: Bends light rays and returns reverse image to normal.

Lens Barrel: Keeps the distance between the eyepiece lens and the objective lens consistent. Blocks side lighting and protects lenses from dirt.

Objective Lens: Gathers light in a convex lens. This is the lens that has a millimeter measurement (i.e., 6x30).

Diagram of Binocular Design



2. How do I get binoculars to work specifically for me?

Taking care of binoculars:

- Always keep them attached around your neck so they aren't accidentally dropped.
- While you are focusing binoculars, stand still. It would be easy to fall while focusing and walking simultaneously.
- Clean binoculars properly.

If you wear eyeglasses:

- Keep your eyeglasses on.
- There is usually an "eye cup" rubber piece that folds back where your eyeglasses meet the eyepiece lens.

Things you adjust once:

- Barrel distance: the two barrels can be moved closer or further apart depending on the distance between your eyes.
- Focus right eyepiece: there is a knob on the right eyepiece that corrects for visual differences between your two eyes. If you are seeing more than one image, adjust the right eyepiece until there is just one image.

Things you need to adjust with each observation:

- Center focus: Adjust the center focus with each observation to bring image into view.

Focusing on an image:

- Adjust the barrel distance and right eyepiece.
- Locate the image with your eyes. Are there any landmarks or reference points near to the image? These may help you find the image using the binoculars.
- Focus your eyes on the image. Without looking down, place the binoculars directly in front of your eyes. The rubber cup surrounding the eyepiece lens should rest against your eyebrow (unless you are wearing eyeglasses).
- Focus the image into view with the center focus. Keep your elbows tucked in close to your body, and keep both hands on the binoculars to avoid a shaky image.



3. Practice using binoculars.

Focus on a stationary object.

- Pick an object that doesn't move. Choose one that is somewhat near, and one that is somewhat far. Use the center focus.

Focus on moving objects in class.

- Right/left: have a student walk slowly across the classroom while the remaining students use their binoculars to follow in view. Speed up the student walker to add a challenge.
- Away/toward: choose a student to move toward and away from the binoculars. Discuss the range at which the binoculars will work. At some point, the student (or object) will become too close to focus.

Focus on multiple moving objects at school.

- Attend a sporting event or practice at lunch in the cafeteria.
- Place a wildlife poster on a piece of cardboard and stick. Have a student move the posterboard around the classroom: slow, fast, up, down, toward, away.

Focus on wildlife.

- Bring the class outside to an area where they are likely to view moving wildlife such as birds.



Investigating Tule Elk

On-Site Activities

How Do Researchers Survey Tule Elk?	103
How Can I Capture My Experiences in a Story, Poem or Drawing?	121
How Can We Inspire Others to Protect Tule Elk and Their Habitat?	125

How Do Researchers Survey Tule Elk?



On-site Lesson Plan

Students will use their field journals to record observations during their visit to the tule elk range at Point Reyes National Seashore. Each student will survey the habitat and elk populations using methods and data sheets similar to those used by researchers.

Time required: 2 hours

Location: Tomales Point Trail, Tule Elk Range, Point Reyes NS

Group size: all

Subject(s): science, math, writing

Concept(s) covered: tule elk identification and behaviors

Written by: Christie Denzel Anastasia and Lynne Dominy,
National Park Service

Adapted by: Kim Linse and Melinda Repko, National Park
Service

Last updated: 06/01/01

Student Outcomes

At the end of this activity, the students will be able to:

- Identify and record tule elk behaviors in field journals while visiting Point Reyes National Seashore.

California Science Standards Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

- 6th grade
- 5a - food webs
 - 5b - organisms and the physical environment
 - 5e - numbers and types of organisms an ecosystem can support depends on the resources available
 - 7b - appropriate tools and technology to perform tests, collect and display data
 - 7d - communicate the steps and results from an investigation
 - 7f - interpret a simple scale map
 - 7h - identify changes in natural phenomena over time





- 7th grade 7a - appropriate tools and technology to perform tests, collect and display data
7c - communicate logical connections
7d - construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge

National Science Standard Links (Grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A-Use appropriate tools and techniques to gather, analyze, and interpret data; understanding about scientific inquiry
- Content Standard G-Science as a human endeavor; Nature of Science: students formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models

Materials

Available for checkout at Bear Valley Visitor Center or use at Clem Miller:

- Tule Elk Kit

Procedures

1. Stop at Bear Valley Visitor Center

Pick up your reserved Tule Elk Kit at the Bear Valley Visitor Center in Olema. This is also a good place to fill water bottles, use the restroom, or have lunch at the picnic area. See the map of Point Reyes National Seashore located in the Attachments section of Teacher Preparation for the exact location of the Bear Valley Visitor Center.

2. Drive to Tule Elk Reserve

Pick up a map and get directions to the Tule Elk Reserve at the visitor center. Instruct students to watch for the ten-foot high fence separating the tule elk from the cattle. Once you go beyond this fence, you may see tule elk from your vehicle.

3. Review Safety Messages

Use the information on **Things to Remember While on Field Trip** to discuss safety messages and what to do in the event of an accident.

4. Stop at Trailhead

The **Habitat Survey at Trailhead** Field Journal Sheet should be filled out at the beginning of the trail.

5. Proceed to Elk Viewing Location

Instruct the students to keep their eyes out for a herd of elk. Once the herd is spotted, instruct the students to be quiet and move slowly. Three field journal sheets will be filled out while observing the herd. If there are multiple locations where elk are visible, you may consider dividing your students and sending smaller groups with chaperones to the other areas.



The Elk Population Survey, Elk Behavior Survey, and Mapping field journal sheets will all be filled out with the information from the same herd. Normally elk are visible at White Gulch, which is about a half hour hike from the trailhead.

6. Find Location for Habitat Survey Field Journal Sheet

Consider hiking to an area away from the tule elk for this field journal sheet. You may break students into smaller groups and assign them an area to sit down while completing this field journal sheet.

7. Locate an Exclosure

While hiking back to your vehicles, instruct the students to keep their eyes out for a small fenced in area on the Tule Elk Range. If one is spotted, you may hike your class out to the location (single file is best). Students should keep their eyes out for badger holes which could trip a student not paying attention. Complete the **Exclosure** Field Journal Sheet at the exclosure location.

8. Find Location for Human Influences on Tomales Point Field Journal Sheet

While hiking back to your vehicles or at the trailhead, find another location to complete the Human Influences on **Tomales Point** Field Journal Sheet. Again, spread the students out with chaperones interspersed between the entire group.

9. Wrap-Up

Make sure students have everything they brought on the field trip. Consider driving the vehicles down to McClures beach where there is a pit toilet. Ensure that there is enough time to return the Tule Elk Kit to the Bear Valley Visitor Center before 5:00pm.



Field Journal Sheet

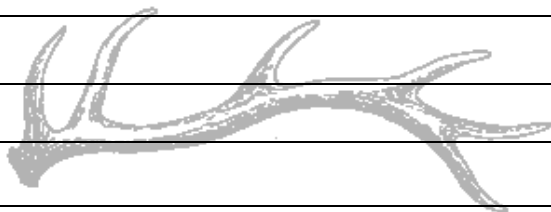
Things to Remember While on Field Trip

Three safety precautions:

1.

2.

3.



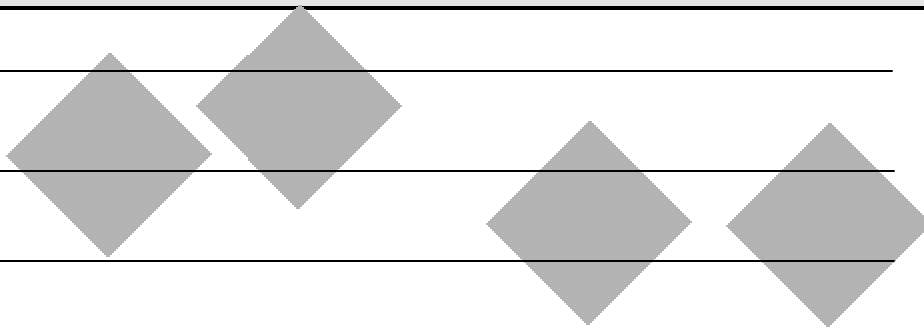
Four resource protection behaviors:

1.

2.

3.

4.

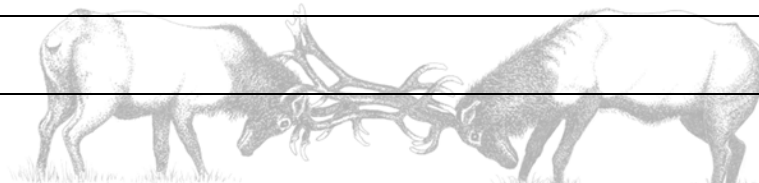


If I were a tule elk, I would want...

1.

2.

3.





Field Journal Sheet

Habitat Survey at Trailhead

Take a moment to observe everything surrounding the area where tule elk are or could be located. Use what you see and know to answer the following:

Date	
Time	
Season	
Air temperature	
Percentage of cloud cover	
Rain	
Wind speed	

Describe the location

--





Field Journal Sheet

Elk Population Survey

In the chart below, record your observations while very quietly watching tule elk.

Location:			Time:	
Bulls	Cows		Calves (males/ females)	Total number of elk
	with radio collars*	without radio collars		

*Record the radio collar color combinations (reading from top to bottom)

--

List any "signs" of elk that you observe

--

Other observations

--

Field Guide to Elk Behaviors



Field Journal Sheet

The following guide explains common behaviors that you might witness during your field trip.



Bugling

The bull puts his neck out, his muzzle up, and lets out a long, high-pitched whistle followed by a series of low grunt.

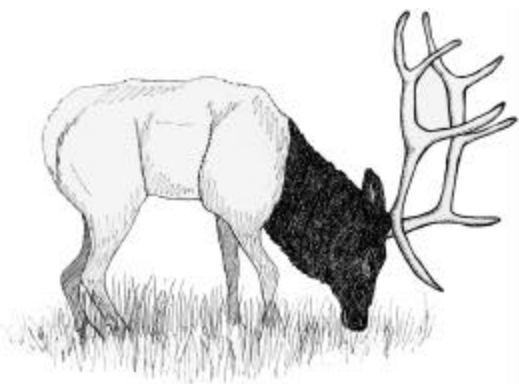


Boxing

Two cows rear up on their back legs and clash hooves. This display is believed to be a sign of aggression. Antler-less males also "box."

Nursing

feeding at the breast



Grazing

Eating grass

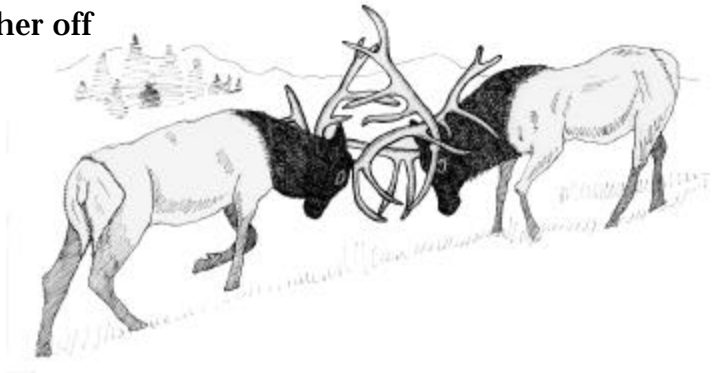


Field Guide to Elk Behaviors



Locking Antlers

During a serious battle, two bulls may lock antlers and try to throw one another off balance.



Thrashing

A bull uses his antlers to thrash the ground or vegetation.

Charge

When males lunge at one another either as a threat or in the beginning of a battle.



Grimace

A bull sticks his head forward and upward while curling back his upper lip. He is "testing" the air to sense if a female is ready to breed.



Field Journal Sheet

Elk Behavior Survey

Carefully observe elk behavior. Use the Field Guide to Elk Behaviors on the previous page as a reference tool. Record your observations in the following chart. Include the numbers(s) and sex of the elk that you see displaying these behaviors.

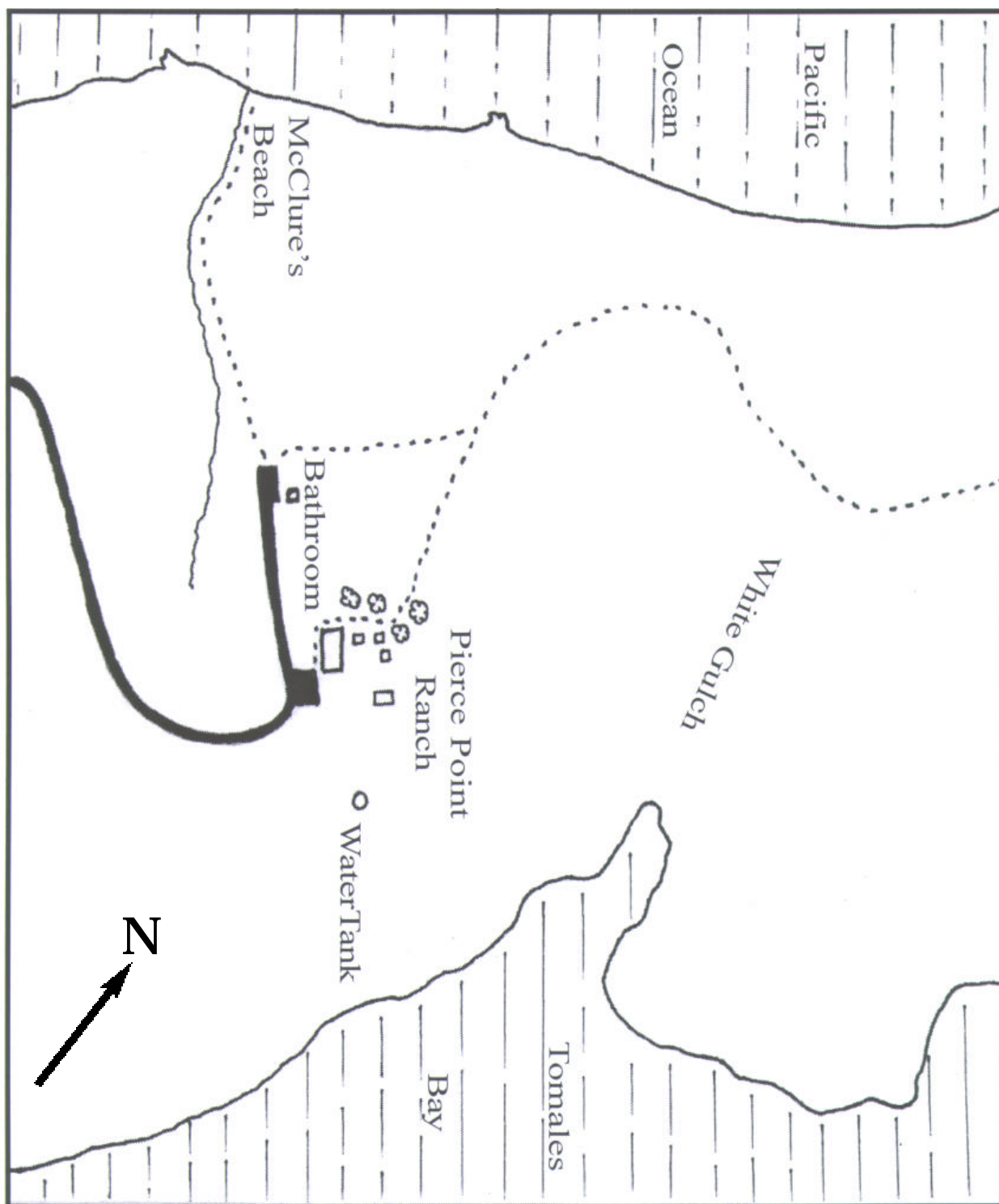
Location		Time	
Behavior	Bull	Cow	Calf

How might today's weather effect elk behavior? What might they do differently if it were rainy? Windy? Sunny?



Mapping: White Gulch

- Orient yourself to the map by locating the Ocean, Tomales Bay, and the trail. You will probably have to turn your map around to have you and your map facing Tomales Bay. Mark your location on the map with an "X".
- Shade the entire area where the herd is located lightly with a pencil. Next, mark where individuals are located within that shaded area by marking "B" for bulls, "C" for cows, "CR" for cows with radio collar, and "CA" for calf.

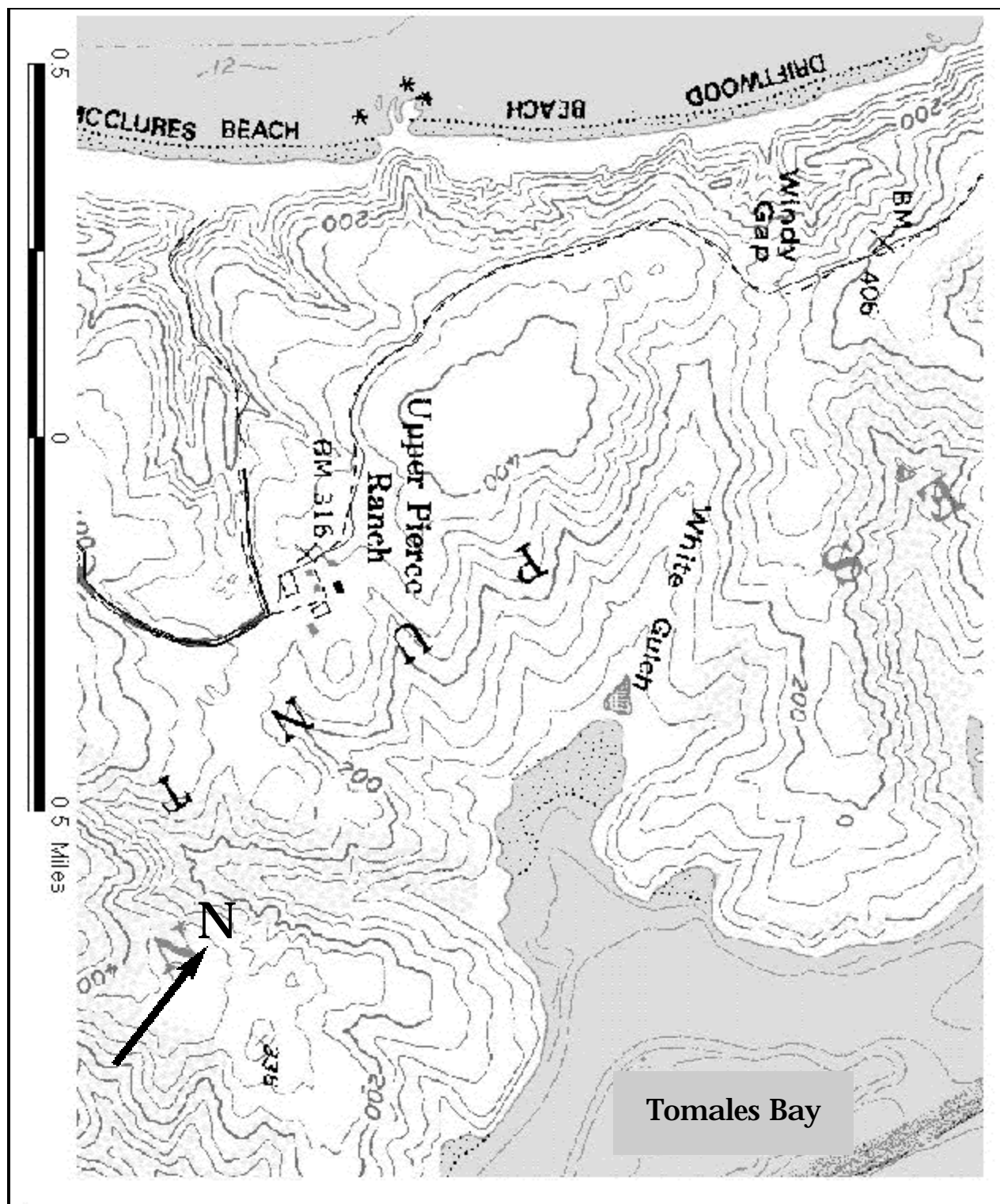


Mapping: White Gulch



Field Journal Sheet

- Orient yourself to the map by locating the Ocean, Tomales Bay, and the trail. You will probably have to turn your map around to have you and your map facing Tomales Bay. Mark your location on the map with an "X".
- Shade the entire area where the herd is located lightly with a pencil. Next, mark where individuals are located within that shaded area by marking "B" for bulls, "C" for cows, "CR" for cows with radio collar, and "CA" for calf.





Mapping: Other Locations

- If you would like to map tule elk in other locations, use the space below. Start by sketching a rough outline of the land and any additional landmarks. Next, mark your location on the map with an “X.”
- Shade the entire area where the herd is located lightly with a pencil. Next, mark where individuals are located within that shaded area by marking “B” for bulls, “C” for cows, “CR” for cows with radio collar, and “CA” for calf.



Field Journal Sheet

Habitat Survey on Tomales Point Trail

Before this area was designated a National Seashore, people used it in a variety of ways. Even today, humans have a direct impact on this habitat by hiking, horseback riding, and living nearby. Think about the human influences on this area and answer the following questions.

What makes this location suitable for tule elk?

Where do the elk get their drinking water?

Circle the animal signs that you see while on the Tomales Point Trail:

scat tracks burrows bones antlers nests other:

In the space below, sketch two types of sign that you have seen:

Describe what this sign tells you about the animal:

Describe what this sign tells you about the animal:



Field Journal Sheet

Exclosure

Look for small (1-acre or less), fenced-in areas within the elk range. These areas are called exclosures. When you see one close to the trail, let your teacher know. Hike very carefully to where you can carefully observe the exclosure.

What do you think these areas exclude and why did researchers build them?

Is the vegetation inside the fenced-in area different from the vegetation outside the exclosure? How and why?

Are all animals "excluded" from entering inside the exclosure, or just larger ones?



Field Journal Sheet

Human Influences on Tomales Point

Before this area was designated a National Seashore, people used it in a variety of ways. Even today, humans have a direct impact on this habitat by hiking, horseback riding, and living nearby. Think about the human influences on this area and answer the following questions.

What signs of historic use do you see?

What signs of recent impact do you see?

What are some of the impacts on Tomales Point from being so close to a major city like San Francisco?

Have you affected any elk today? How?

How Can I Capture My Experiences in a Story, Poem or Drawing?



On-Site Lesson Plan

Students will use their experience with tule elk to create a story, poem, or drawing. Drafts or sketches may be made in their field journals and final writings or drawings completed in class. Students or teachers are able to choose which activities will be completed.

Time required: ½ hour

Location: on-site/classroom/homework

Suggested group size: entire class

Subjects: creative writing; science, language arts

Concepts covered: poetry; creative writing

Written by: Melinda Repko, National Park Service

Last updated: 12/08/00

Student Outcomes

At the end of this activity, students will be able to:

- Reflect on their experiences by sharing a poem, story, or drawing.
- Make emotional connections to the resources.

Materials

To be supplied by teacher:

- Extra paper to be included in field journal

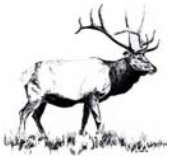
To be photocopied from this guide:

- **How Can I Capture My Experiences in a Story, Poem or Drawing?** field journal sheet

Procedures

1. Include a copy of the **How Can I Capture My Experience in a Story, Poem, or Drawing?** activity sheet in each student's journal.
2. Either choose an activity for students to complete or have students decide which they would like to complete.
3. Allow at least one-half hour to complete this activity in the field. Students may refine their work once back in class.





Extension Ideas

1. Have students complete a variety of the activities, creating a booklet of their creative work.
2. Using canvas material and tempera paint, have students create a mural of their experiences at the Tule Elk Reserve.

How Can I Capture My Experience in a Story, Poem, or Drawing?



Field Journal Sheet

Choose one of the following activities. Use blank paper in your field journal to complete your work.

1. Create a Haiku

A three-line poem originating in Japan based on syllables- not rhyming.

Line 1: five syllables
Line 2: seven syllables
Line 3: five syllables

2. Create a Diamante

This five-line poem is displayed in the shape of a diamond.

Line 1: noun
Line 2: adjective adjective
Line 3: participle participle participle participle
Line 4: noun noun noun noun
Line 5: noun

3. Freestyle Poem

A poem can rhyme or not rhyme. It can be many words or few. The only limitation is your imagination!

4. Create an Outline-Creation

Draw the outline of a tule elk in pencil. Use the outline as a guide to write your words on OR use the outline as a guide to write your words in.

Use words or sentences that describe its characteristics. Hint: if you draw in pencil and write in pen, you can carefully erase the pencil when the ink dries.

5. Create a Comic Strip

Think about the different events that took place while you were visiting the Tule Elk Reserve. Create a comic strip depicting one of these events. Don't forget to give your comic strip a title.

6. Create a Story

Answer the question: "What would be missing from your life if tule elk had gone extinct and you never had the chance to see them?"

How Can We Inspire Others to Protect Tule Elk and Their Habitat?



Students will videotape tule elk on their field visit, and use this medium to foster stewardship with elementary classes. There is also the possibility of showing this medium via local programming.

Time required: 15 minutes at field visit, various amounts of time depending on strategy

Location: Point Reyes National Seashore/ classroom

Group size: small groups

Subject: language arts

Concept covered: stewardship education

Written by: Trudie Behr Scott, Novato School District

Last updated: 11/25/01

On-Site Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Formalize a presentation on tule elk.

National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard F - Populations, Resources, and Environments: Causes of environmental degradation and resource depletion vary from region to region and from country to country; Risks and Benefits: Important personal and social decisions are made based on perceptions of benefits and risks.

Materials

To be provided by the teacher:

- Camcorder to be used on visit

Vocabulary

stewardship





Procedures

1. Research local public access channels. Most are required to show 20 minutes/month local programming OR identify other elementary classes that would be interested in viewing a presentation on tule elk by your class.
2. Secure camcorder/tape for day of field visit. One adult chaperone could rotate with the camcorder to each of the three groups for 5-10 minutes of videotaping. (If you have access to editing equipment, students may tape longer segments).
3. Back at school, have students create a dialogue (to be superimposed on video images) discussing some of the following points.

Why are there tule elk at Point Reyes National Seashore?
What are some threats to tule elk and their habitat?
What can we do to protect a tule elk's right to exist?
What was the most enjoyable aspect of viewing tule elk?
What do we mean by stewardship?
What have we done already to help tule elk?
What would we like to be able to do in the future?

4. When the video is completed, please mail a copy to the project coordinator at Point Reyes National Seashore.

Extension Ideas

1. When have videotaped images been used to persuade populations (World Wars I and II, Echo Park Dam controversy at Dinosaur National Monument, commercials, television)? Encourage students to investigate how media can control our actions and thoughts.



Investigating Tule Elk

Post-Visit Activities

What Can We Learn From Our Field Journals?	129
How Do I Choose and Complete the Best Stewardship Project?	139

What Can We Learn From Our Field Journals?



Students analyze data from their field journals to understand how this type of information is used to make management decisions concerning tule elk. Students will also practice making decisions that affect the tule elk herd within Point Reyes National Seashore through the use of "dilemma" cards.

Time required: 2 hours

Location: classroom

Suggested group size: entire class

Subjects: science, language arts, math

Concepts covered: decision making and use of information

Written by: Christie Denzel Anastasia, National Park Service

Last updated: 05/30/01

Post-
Visit

Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Understand the significance of fieldwork results.
- Solve challenges relating to tule elk management.

California Science Standard Links (grades 6-8)

This activity is linked to the California Science Standards in the following areas:

- | | |
|-----------|---|
| 6th grade | 5b - organisms and the physical environment |
| | 5e - numbers and types of organisms an ecosystem can support depends on the resources available |
| | 7d - communicate the steps and results from an investigation |
| | 7e - evidence is consistent with a proposed explanation |
| 7th grade | 7c - communicate logical connections |
| | 7e - communicate the steps and results from an investigation |
| 8th grade | 9b - evaluate the accuracy and reproducibility of data |

Creating
COASTAL
STEWARDSHIP
through Science





National Science Standard Links (grades 5-8)

This activity is linked to the National Science Standards in the following areas:

- Content Standard A - Use appropriate tools and techniques to gather, analyze, and interpret data; think critically and logically to make the relationship between evidence and explanations; recognize and analyze alternative explanations and predictions; communicate scientific procedures and explanations; use mathematics in all aspects of scientific inquiry; understandings about science and technology.
- Content Standard C - Populations and ecosystems.

Materials

To be photocopied from this guide:

- **Tule Elk Management Plan Summary** Teacher Information Sheet
- **Dilemma Cards** Activity Sheet (one copy for entire class or one copy per student)

Procedures

1. Review Journals

As a class, brainstorm a list of all the different types of information collected on the field trip and recorded in the journals. Discuss how all of these different types of information help to accurately portray the complexity of life on Tomales Point. It is important to explain that these types of information would be collected over a long period of time to show variance in season and long-term trends.

2. Review Behaviors

Focus on the **Behavior Survey** field journal sheet by brainstorming a list of all the behaviors observed. Have students compare the behaviors observed to **The Annual Life Cycle of Tule Elk** diagram in the tule elk newspaper. Were their observations consistent with the information on the diagram?

3. Review the Tule Elk Management Plan Summary

Challenge the students to find connections between the information they gathered in the field and how it can help guide management decisions.

Examples:

- Determine a carrying capacity for the elk range and maintain those numbers in dynamic equilibrium with other organisms in the ecosystem.
- In order to determine the carrying capacity, researchers must know how many elk are on the range from year to year, and the condition of the habitat. This would be done through a Population Survey and a Habitat Survey.
- "Research and monitor the habitat and elk population over time." Information gained through a Population Survey, Habitat Survey, and Behavior Survey over time would help managers accomplish this goal.



4. Dilemma Cards

There are eight "Dilemma Card" scenarios on activity sheets following this lesson. Divide the class into several groups and assign the group a dilemma that they must resolve. Allow time for discussion and instruct the students that they will need to present their opinion to the class. As each group presents their scenario allow time for other students to express their opinion. Ask each group: if you could have had more information to base your decision upon, what would you need to know? The answer to this question is what drives scientific research and monitoring. Articulating the questions is one of the most important components of good research design.

Extension Ideas

1. Have students produce a journal illustrating their class trip with photos, field journal sheets, maps, drawings, and poems. Show these at a Parent's Night and/or mail copies to Point Reyes National Seashore. We would like to use some of these materials for evaluation and generating further support for our education programs.



Tule Elk Management Plan Summary

The following information was taken from the Tule Elk Management Plan and Environmental Assessment, 1998:

Resource Management Plan

- Re-establish a healthy tule elk population on a range which has returned to a natural successional regime as if elk were always present.
- Determine a carrying capacity for the elk range and maintain those numbers in dynamic equilibrium with other organisms in the ecosystem.
- Create and maintain safe visitor observations of wild tule elk by recognizing and minimizing human/elk conflicts.

Mission

- Adaptively manage elk as a natural component of the dynamic ecosystem of Point Reyes.
- Assist in the preservation of tule elk as a subspecies and the genetic diversity it contains.
- Manage tule elk consistent with other management objectives, including agriculture, public visitation, and the protection of natural, cultural, and recreational resources.

Management Goals

- Maintain viable populations of tule elk at Point Reyes.
- Manage tule elk using minimal intrusion to regulate population size, where possible, as a part of natural ecosystem processes.
- Provide for a free-ranging tule elk herd in Point Reyes by 2005.
- Research and monitor the habitat and elk population over time.
- Provide the public with interpretation and information on tule elk conservation biology and management.

**Dilemma Cards****Activity Sheet****DILEMMA CARD ONE**

Tule elk have been relocated into a Wilderness Area. Wilderness Areas exclude mechanized equipment and vehicles (except for use in emergencies and threats to life). The best way to begin elk relocation efforts is to use a helicopter. Superintendents of National Park Service areas are allowed to decide on an "minimal tool" to establish a free-ranging herd. As a member of the superintendent's management team, do you...

- allow trucks into the Wilderness Area because the National Seashore already owns trucks that would be cheap to use for relocating elk? Helicopters would be too noisy, expensive, and disturb the herd.
- allow helicopters because they are quick and will have less of a long-term effect overall? The extra cost is worth it.
- not allow any exceptions in a Wilderness Area? Everything will have to be done on foot. This option will take a long time and could impact whether or not relocation efforts will work.
- other

DILEMMA CARD TWO

In the recent past, Tomales Point was used for cattle grazing. Water impoundments (artificial ponds) are still present on the Point. Historically, seep-fed springs were the water source, not impoundments. Ideally these impoundments would be removed. However, the California threatened red-legged frog makes these impoundments its home. As an ecosystem manager, do you.....

- remove the impoundments? It is not a natural water source for the tule elk or the California red-legged frog.
- keep the impoundments, but put fences around them to keep the tule elk away and protect the California red-legged frog.
- begin a long-term study that will monitor the effect of these water impoundments on the populations of both species?
- other



Name _____ **Date** _____

Activity Sheet

Dilemma Cards

DILEMMA CARD THREE

It is the policy of Point Reyes National Seashore to reduce and eliminate non-native species where and when possible. Grazing at Tomales Point has increased nonnative plants such as thistles. The endangered adult Myrtle's silverspot butterfly uses these thistles as a food/nectar source. As the plant biologist at the National Seashore, do you...

- choose the butterfly over the native plant populations by allowing the thistle to grow?
- choose native plant populations over the butterfly and remove the thistle?
- try to strike a balance between the two options until you have further information on all the species, including how the tule elk may or may not impact these two species?
- other

DILEMMA CARD FOUR

You are hiking and begin to approach a tule elk herd at Tomales Point. You hear bugling but cannot see the elk. As you hike off-trail to see the elk, you see them running in the opposite direction. Do you...

- try to catch up to the elk to get a better photo?
- stand still and wait for them to move?
- sit down and think about a better way to approach the next herd you may come across on your hike?
- other

DILEMMA CARD FIVE

Out on a class trip, you see something white underneath a shrub at Tomales Point. As you get closer, you become very excited because you have found a tule elk antler that was shed several months ago. No one is with you and you could very easily slip it into your backpack. Do you...

- pick up the antler and throw it farther so no one else will be tempted as much as you were?
- take the antler; there must be so many antlers out here, one less antler will not make a difference.
- leave the antler as a source of calcium for rodents?
- other





Dilemma Cards

DILEMMA CARD SIX

While eating your lunch at Limantour Beach, a coyote approaches you, eyeing your ham sandwich. Do you...

- share your sandwich since this coyote must be lost from the pack and you can see he looks thin?
- get up and shout as loud as you can, making it clear that at least some humans can be a threat to coyotes?
- accidentally get bit on the hand because you try to pet the coyote?
- Other

DILEMMA CARD SEVEN

You are a ranch owner. One day while out in your field, you find several animals which no one has seen anywhere in the county for ten years. You decide to...

- set up an enclosure and viewing area, charging visitors \$10 each to see them.
- contact federal and state authorities.
- trap and sell them.
- shoot them, because you believe these animals have been burrowing holes all over your property.

DILEMMA CARD EIGHT

Tule elk have been reintroduced to a restricted area. Population growth is very high and weather trends indicate several years of drought approaching. As a wildlife manager you...

- decide nutritional pellet supplements need to be bought; Park Rangers will feed the herd until the rains are more regular.
- let nature take its course.
- reduce the population size.
- all of the above
- none of the above
- other

How Do I Choose and Complete the Best Stewardship Project?



The final lesson for this unit synthesizes all previous learning experiences. Students have gained an understanding of tule elk, their habitat, and some of the challenges they face as a species. Now it's time to take action by understanding how all of these elements fit together and how we as humans fit into the survival of this species.

Time required: time varies

Location: classroom, community, or Point Reyes National Seashore

Group size: entire class

Subjects: biology, art, computer skills, community service

Concepts covered: stewardship, educating others, environmental responsibility

Written by: Sarah Davis, National Park Service

Last updated: 12/04/01

Post-
Visit

Lesson Plan

Student Outcomes

At the end of this activity, the students will be able to:

- Synthesize all other pre-visit, on-site, and post-visit lessons from this unit.
- Plan and implement an environmental stewardship activity to benefit the ecosystem they live in and depend upon.

National Science Standard Links

As a result of this activity, all students in grades 6-8 should develop:

- Content Standard F - Science in Personal and Social Perspectives; Populations, Resources, and Environments.

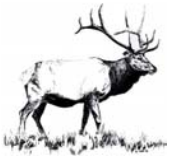
Materials

To be provided by the teacher:

- Varies by project, see **Investigating Tule Elk: Environmental Stewardship Projects** Teacher Information

Creating
COASTAL
STEWARDSHIP
through Science





Vocabulary stewardship

Post-Lesson Plan Visit

Procedures

1. **Decide on lesson approach based on time limitations**

Review the teacher resource **Investigating Tule Elk: Environmental Stewardship Projects** following this lesson. This resource explores the range of stewardship projects your class can complete according to time constraints. There are many possibilities ranging from short lessons to more in-depth, interdisciplinary projects that may fulfill educational standards for other subject areas.

2. **Prior to any lesson, introduce concept of environmental stewardship**

Begin a discussion of who has responsibilities for natural resources. There are federal agencies such as the National Park Service and United States Forest Service, state agencies such as California Fish and Game, and local organizations. Introduce the concept that organizations such as schools and individuals such as students also have responsibility.

Every day we decide on an individual level what our impact will be on the environment based on our actions. It's usually positive or negative, rarely neutral.

3. **Lesson options**

How Are Decisions Made for Tule Elk Activity Sheet

What Is the Future of Large Mammals Activity Sheet

Create Tools to Educate Others

Implement a Community/School Project

Participate in Volunteer Programs: Point Reyes National Seashore

Support Stewardship Organizations and Be an Advocate for Your Beliefs

(see the teacher resource **Investigating Tule Elk: Environmental Stewardship Projects** following this lesson for more details)



Investigating Tule Elk

Environmental Stewardship Projects



Teacher Information

How Are Decisions Made for Tule Elk?

One to two lessons

Students use the **How Are Decisions Made for Tule Elk?** activity sheet to learn more about other deer species found at Point Reyes National Seashore. Based on that research, students devise action plans for the future of tule elk.

What is the Future of Large Mammals?

One to two lessons

Students use the **What is the Future of Large Mammals?** activity sheet to learn more about large mammals across the globe. Students will also investigate management concerns for these species and compare/contrast these concerns with tule elk.

Create Tools to Educate Others

Arranged in order of possible time commitment, shortest to longest

Lead a class discussion to brainstorm ways students can educate others. Use the list below to help students generate ideas. Once there are a number of ideas, decide which project can be completed within a designated timeframe. Have students create a “plan of action.” What are all the things that need to be done, in what order do they need to be done, who is going to do them, and what are the deadlines? How can students not only teach about the resource, but also impart stewardship values? Remind students to think about any safety issues and address these as a group.

Educational tool ideas:

- Develop a newsletter or newspaper to distribute to other students.
- Build an exhibit that is displayed for a Parents’ Open House.
- Paint a mural, draw posters, or create a website that encourages coastal stewardship.
- Interview researchers about an elk research project. Share the answers.
- Organize a coastal stewardship contest. Have students define stewardship through writing essays or creating art, poetry or music.
- Videotape your field trip and stewardship activities. Have the students narrate this video and develop a presentation for other students, sharing what they have learned and accomplished.
- Create a mentoring program that enables your students to teach younger students about resources and their stewardship.



Environmental Stewardship Projects

(continued)

Implement a Community/School Project

Arranged in order of possible time commitment, shortest to longest

Instruct students to find at least one local environmental issue that is being discussed among community members. Students may gain this information by looking through newspapers, talking to their parents, watching the local news, or listening to a public radio station. The next day in class, all local environmental issues should be discussed to some extent. Choose one project around which students may design a stewardship project. What are the possible stewardship activities that can be completed by students, and/or their parents, and communities? Follow the ideas in the procedure above to create a plan of action.

Community/School Project Ideas:

- Work with any local community issues most relevant to your students.
- Practice water conservation at school and home.
- Create a green school: investigate recycling and composting facilities or water conservation. Have students write a plan about how to make your school more environmentally friendly. Have them take action and implement some of their ideas.

Participate in Volunteer Programs: Point Reyes National Seashore

2-hours, full day, or regular commitment on weekly/monthly basis

Students may participate in programs such as restoration, rehabilitation, or research projects. Consult with the Volunteer Coordinator or Education Specialist for the most recent options, as projects can change according to time of year and staffing availability. One example of participating in a restoration project would be to remove exotic plants from natural areas. To participate in the habitat restoration projects at Point Reyes National Seashore call (415) 464-5195.

Support Stewardship Organizations and Advocate Your Beliefs

one lesson to lifelong commitment

Introduce students to the concept of advocacy. Have them research and represent the missions of local and national stewardship organizations. Examples include the National Park Service, the Marine Mammal Center, the Humane Society, the Sierra Club, the National Parks and Conservation Association, and the Audubon Society. Have students write letters to their local, state and national government officials regarding stewardship issues or have them submit articles to local newspapers. Encourage students to form educated opinions and to voice them.

How Are Decisions Made About Tule Elk?



FIRST, you must learn about tule elk and other deer found at Point Reyes National Seashore:

Start by reading "Deer at Point Reyes National Seashore" and completing the chart below:

	tule elk	black-tailed deer	axis deer	fallow deer
Origin: Where do these deer come from?	California	central and coastal California	India, Nepal, and Sri Lanka	Southern Europe and Asia Minor
Range: Where are these deer found at Point Reyes National Seashore?	Tomales Point and Limantour area	forests and grasslands	Lighthouse and Chimney Rock areas, and near Marshall Beach	open pastures with oak woodland
Rutting Season: When is the mating season for these elk?	Summer and early Fall	Fall	breed all year	Fall
Distinguishing Characteristics: How can you tell them apart from other deer?	conspicuous dark mane	grayish brown coat	white spots on adult coat	goatlike in appearance, "moose-like" antlers

SECOND, you must understand how these deer relate to the environment:

- List two native deer:
tule elk, black-tailed deer
- List two non-native deer:
axis deer, fallow deer
- Define the words below:

Native

originally belonging to a specific place

Nonnative

not originally belonging to a specific place



How Are Decisions Made About Tule Elk?

(continued)

- What is being done to control the population of tule elk?
immunocontraception program
monitoring of population
- Is anything being done to control the populations of axis, fallow, or black-tailed deer?
monitoring of population

THIRD, you must use your knowledge and wisdom to make decisions:

You have just recently been appointed superintendent of Point Reyes National Seashore. Your first major task as superintendent is to develop a management plan for deer species in the Seashore. Think about what you have learned about tule elk and what you observed on your visit to the Tule Elk Reserve. Use that information and experience to answer the questions below.

- List three challenges facing species of deer in the National Seashore:
Non-native deer may be competing with natives.
Tule elk at Tomales Point⁵ may have a limited habitat.
Non-native populations could dramatically increase.

Decide which of the challenges you listed above is the most important, the second most important, and finally the third most important. Place the numbers "1," "2," and "3" next to your challenges in the boxes above.

- What are your reasons for choosing "1" as the most important?
- Focus on the challenge you decided was the most important, brainstorm three solutions that would make the situation better.

Congratulations, you have created your first plan of action to make Point Reyes Seashore a better place!

Name _____ Date _____



How Are Decisions Made About Tule Elk?

FIRST, you must learn about tule elk and other deer found at Point Reyes National Seashore:

Start by reading "Deer at Point Reyes National Seashore" and completing the chart below:

	tule elk	black-tailed deer	axis deer	fallow deer
Origin: Where do these deer come from?				
Range: Where are these deer found at Point Reyes National Seashore?				
Rutting Season: When is the mating season for these elk?				
Distinguishing Characteristics: How can you tell them apart from other deer?				

Activity Sheet

SECOND, you must understand how these deer relate to the environment:

- List two native deer:

- List two non-native deer"

- Define the words below:

Native _____

Non-native _____



Name _____ Date _____

How Are Decisions Made About Tule Elk? (continued)

Activity Sheet

- What is being done to control the population of tule elk?
- Is anything being done to control the populations of axis, fallow, or black-tailed deer?

THIRD, you must use your knowledge and wisdom to make decisions:

You have just recently been appointed superintendent of Point Reyes National Seashore. Your first major task as superintendent is to develop a management plan for deer species in the Seashore. Think about what you have learned about tule elk and what you observed on your visit to the Tule Elk Reserve. Use that information and experience to answer the questions below.

- List three challenges facing species of deer in the National Seashore:

☐

☐

☐

Decide which of the challenges you listed above is the most important, the second most important, and finally the third most important. Place the numbers "1," "2," and "3" next to your challenges in the boxes above.

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- Focus on the challenge you decided was the most important, brainstorm three solutions that would make the situation better.

Congratulations, you have created your first plan of action to make Point Reyes Seashore a better place!



Deer at Point Reyes National Seashore

Four species of deer are found at Point Reyes National Seashore. Two of these species, black-tailed deer and tule elk, are native to this area. The two others, fallow and axis deer, are exotic, or nonnative species that were introduced by local residents for hunting purposes in the mid-1940s and 1950s. The National Park Service has a mandate to manage for native species, so Point Reyes National Seashore is currently developing a management plan for all deer species.

Black-tailed Deer



Description: Large ears and a grayish brown coats with forked antlers, with two to five points on each side

Herd Size: Varies from a few animals to larger herds of up to 20

Rutting Season: Fall

Native to: Central and coastal California

Local Range: The forests and grasslands of the National Seashore



Tule Elk



Description: A conspicuous dark mane with a tan coat and a distinctive white rump; large, branched antlers of three to six points on either side

Herd Size: During the breeding season, males form harems of females of three to fifty animals.

Rutting Season: Summer and early fall

Native to: California

Local Range: Tomales Point Reserve and Limantour area



Deer at Point Reyes National Seashore

Axis Deer



Description: Reddish brown coat with white spots along the back and sides; tall, straight antlers that fork at the top

Herd Size: Found in herds of up to 150 individuals year round

Rutting Season: Breed all year

Native to: India, Nepal, and Sri Lanka

Local Range: Lighthouse and Chimney Rock areas and near Marshall Beach



Fallow Deer



Description: Goat like in appearance with large palmate “moose like” antlers; one of four different colors including menil (spotted) and white

Herd Size: In winter, fallow deer form groups of up to 120 individuals

Rutting Season: Fall

Native to: Southern Europe and Asia Minor

Local Range: Open pastures lined with oak woodland; heavily concentrated in Olema Valley



Name _____ **Date** _____



What is the Future of Large Mammals

Activity Sheet

You have studied the tule elk and their management concerns. Now compare them to other large mammals across the world. Choose one mammal from the list below and use a variety of research tools (library, Internet, parents, teachers) to answer the questions below. Keep in mind that large mammals require large habitats and that their future is becoming more difficult as human population increases.

CALIFORNIA:	<input type="checkbox"/> grizzly bear	<input type="checkbox"/> mountain lion	<input type="checkbox"/> wolf
UNITED STATES:	<input type="checkbox"/> bison	<input type="checkbox"/> Florida panther	
INTERNATIONAL:	<input type="checkbox"/> rhinoceros	<input type="checkbox"/> cheetah	<input type="checkbox"/> gorilla

Natural History

Territory size necessary for each animal:

Habitat:

Lifespan:

Diet (herbivore, carnivore, omnivore):

Predators:

Management Concerns

Challenges that face this species:

What is being done to help this species survive?

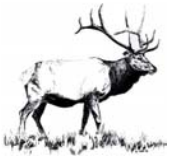
Does this mammal have anything in common with tule elk in terms of its natural history or its management concerns?

The following list is not comprehensive. It is meant to provide ideas for additional teaching resources.



Education and Reference Materials

- Arnold, Caroline. **Tule Elk**. Minneapolis: Carolrhoda Books, 1989.
- Biel, Timothy Levi. **Zoobooks: The Deer Family**. Wildlife Education, Ltd., 1988.
- Bauer, Erwin A. and Peggy Bauer. **Elk: Behavior, Ecology, Conservation**. 1999.
- Bergen, Todd R., ed. **Majestic Elk: Majestic Wildlife Library**. 1998.
- Boyco, Mark. **The Jackson Elk Herd: Intensive Wildlife Management in North America**. Cambridge University Press, 1989.
- Canton, John Dean. **The Antelope and Deer of America**. Arno Press, 1974.
- Geist, Valerius. **Elk Country**. NorthWord Press, 1991.
- Gilmore, Jackie. **Year at Elk Meadow**. Boulder: Roberts Rinehart Inc., 1986.
- Gogan, Peter. **Ecology of the Tule Elk**. UC Berkeley, 1986.
- Houston, Douglas. **The Northern Yellowstone Elk: Ecology and Management**. 1982.
- Krakel, Dean II. **Seasons of the Elk**. The Lowell Press, Kansas City, MO. 1976.
- Jenkins, M. **Deer, Moose, Elk, and Their Family**. Holiday House, 1979.
- Murie, Margaret and Olaus Murie. **Wapiti Wilderness**. New York: Alfred A. Knopf, 1969.
- Murie, Olaus J. **Elk of North America**. Jackson, Wyoming: Teton Bookshop, 1979.
- Peterson, David. **Among the Elk: Wilderness Images**. Northland Pub. Co., 1988.
- Peterson, David. **Racks: The Natural History of Antlers and the Animals That Wear Them**. Capra Press, 1991.
- Rue, Leonard Lee. **The Deer of North America**. Grolier Book Club, 1989.
- Thomas, Jack Ward and Dale E. Toweill. **Elk of North America: Ecology and Management**. Harrisburg: Stackpole Books, 1982.



Wild About Elk

Western Regional Environmental Education Council, Inc., and the Rocky Mountain Elk Foundation, 1994. Project WILD, 5430 Grosvenor Lane, Bethesda, MD 20814. (301) 493-5447

Related Publications

"Biologue: Looking at elk"

Spring 1988, vol. 2, number 3.

Teton Science School, PO Box 68-B Kelly, WY 83011

"Tule Elk Management Plan and Environmental Assessment"

Point Reyes National Seashore, Point Reyes Station, CA 94956. 1998.

Internet Addresses

Arizona Game and Fish Department: Elk Information

http://www.gf.state.az.us/frames/fishwild/idx_game.htm

Chaffe Zoo: Tule Elk and Antlers

<http://www.attitude.com/users/zoo/zoo/animals/elk.html>

Coastal Traveler: Tomales Point Tule Elk article

<http://www.coastaltraveler.com/elk.html>

Garry Ferrence's Home Page: Elk Information

<http://www.iup.edu/~ferenc/>

Grizzly Island Wildlife Area: Tule Elk Management

<http://iep.water.ca.gov/sew/workplan/report/wildlife/elk.html>

Map of Elk Range in North America

<http://www.rmef.org/rang.htm>

National Elk Refuge: National Elk Refuge, Jackson Hole, Wyoming

<http://www.r6.fws.gov/REFUGES/natl elk/index.html>

Oakland Zoo: Fact Card on Elk

<http://www.oaklandzoo.org/atoz/aztlelk.html>

Oregon Zoo: Fact Card on Roosevelt Elk

<http://www.zooregon.org/cards/Cascades/elk.roosevelt.htm>

Owens Valley: Tule Elk Herd and Legislation

<http://thesierraweb.com/sightseeing/tinnemaha.html>



Point Reyes Light: Options for Limiting Tule Elk Herd

<http://www.ptreyeslight.com/stories/may22/elk.html>

Point Reyes National Seashore: Tule Elk

<http://www.nps.gov/pore>

The Rocky Mountain Elk Foundation

<http://www.rmef.org/index.htm>

Sacramento Bee: Tule Elk Bounce Back

<http://www.sac.bee.com/news/beetoday/newsroom/local/012698/localos.html>

San Francisco Gate: A Bull, a Cow and a Calf

<http://www.sfgate.com/getoutside/1996/aug/elkid.html>

Free

The Rocky Mountain Elk Foundation offers free teaching materials about elk and other wildlife.

<http://www.rmef.org/index.htm>

1-800-CALL-ELK (225-5355)

Videos

California's Tule Elk

An award-winning video about California's tule elk, documenting their near demise and a remarkable recovery program. Distributed by the California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA, 95814. (916) 445-5561. 1990, 26 minutes.

Pennsylvania Elk: Reclaiming the Alleghenies

1999. 85 minutes. \$29.24

Join Game Commission biologist Rawley Cogan for a fascinating look at this most intriguing animal. Learn how the original herds were driven to extinction in the 1860s and how farsighted conservationists brought the species back to the state around the turn of the century, only to see them nearly vanish again. Explore the rugged mountains of the Allegheny Plateau, which echo every autumn with the bugling calls of massive bull elk. To order: phone 1-888-888-3459.

Rocky Mountain Elk

Follow the life of the Rocky Mountain Elk. Phone 1-800-292-9005, or visit www.wildlifevideo.com/video.html. 1999. 30 minutes



Wild About Elk

Explore elk habits and habitats with this video produced by the Rocky Mountain Elk Foundation. To order: 1-800-CALL-ELK. 1994.

Resources

Workshops and Classes

Point Reyes National Seashore Association offers naturalist classes. Please call for a calendar and registration form.

PRNSA Field Seminars, Point Reyes National Seashore, Point Reyes Station, CA 94956. (415) 663-1200

